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1990 EDITION

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FOREWORD

At first glance, 1989 seems to have been a tranquil year. Following a flirt with repeated disaster in 1988, the oil market hummed through 1989 as though production discipline had taken hold in the Organization of Petroleum Exporting Countries. Crude oil prices regained ground lost the previous year. Oil companies earned profits from both upstream and downstream operations. But a tranquil year in the modern oil market can simply represent a pause between disruptions. As close readers of the *1990 OGJ Data Book* will see, 1989 contained seeds for future turmoil.

OPEC production discipline was as elusive as ever. The group began the year discussing how to pull its total output back to a then new ceiling of 18.5 million barrels per day. It spent the rest of the year raising the quota to accommodate the reality of overproduction — and never quite catching up. By yearend it had set the first quarter 1990 lid at slightly more than 22 million barrels per day, but continued to produce more than 1 million barrels per day beyond that. *Oil & Gas Journal* estimated OPEC's average production for the year at 21.7 million barrels per day, with Kuwait and the United Arab Emirates the most consistent quota violators.

Just a year earlier, OPEC had produced 2 million barrels per day less than that and pushed the oil market to its knees. Why didn't the higher production wreak more havoc in 1989? Two important trends offset the production mischief. Non-OPEC production sagged and oil demand marched mightily ahead. But important ingredients of both those trends were temporary; in fact, they were reversing late in the year.

The oil production slump occurred mostly in the U.S., where the trend was well established, and the U.K. North Sea, where it was temporary. U.S. production averaged 7.7 million barrels per day, down six percent from 1988 in the fourth consecutive year of decline. With frontier exploration foreclosed for environmental reasons, the slump seemed certain to continue. The U.K. production decline resulted from a series of accidents that temporarily shut in major North Sea fields. British sector output had averaged 2.2 million barrels per day before the first catastrophe — 1988's deadly explosion on the Piper Alpha platform. Subsequent mishaps pulled sector flow to as low as 1.35 million barrels per day in mid-1989.

Production elsewhere in the North Sea, especially the Norwegian sector, climbed during the year, partly offsetting the U.K. losses. And the damaged U.K. facilities returned to work in the second half, bringing sector production back to 2 million barrels per day.

In effect, the net lull in non-OPEC production removed for a time some of OPEC's competition. And demand growth enlarged the market. Late in the year, International Energy Agency estimated full-year demand in the non-Communist world at 51.8 million barrels per day, compared with 50.9 million barrels per day in 1988. In contrast to that increase, non-OPEC supply — including deliveries from Communist countries and processing gains — declined by 400,000 barrels per day to 28.8 million barrels per day. The market, in other words, had room for OPEC's production excesses.

The result was a general crude oil price rise. At mid-December, the year-to-date average of weekly, 1-month forward West Texas Intermediate crude oil futures prices was $16.30 per barrel, 27% above the same average a year earlier. In 1987, the average had been $15.35 per barrel. *OGJ* projected the 1989 U.S. composite refiner's crude oil acquisition cost at $17.75 per barrel, compared with $14.67 per barrel in 1988 and $17.90 per barrel in 1987.

But crude prices were expected to come under new pressure in 1990. Room in the market for OPEC overproduction was shrinking at yearend 1989, thanks partly to the U.K. North Sea production rebound. Demand showed signs of weakness. For example, IEA was projecting continued demand growth in North America during 1990. Yet monthly trends in the U.S. — single biggest consuming nation in the world — pointed the other way. According to American Petroleum Institute, total U.S. petroleum deliveries — a measure of demand — fell 1.7% in November from the same month in 1988 to 17.3 million barrels per day. It was the fifth consecutive month in which deliveries were less than the levels a year earlier. Year-to-date deliveries through November averaged 17.1 million barrels per day, down 0.5% from the comparable figure of 1988.

The monthly U.S. delivery declines didn't constitute a trend, but they were cause for alarm. It doesn't take much of a demand slump in industrialized countries to offset steady growth expected to continue in the developing world, where consumption amounts to less than one-third of the non-Communist total. Significant demand contraction would jolt revenue-hungry OPEC members facing refortified competition from the North Sea and new production from countries such as North Yemen and, in the future, Papua New Guinea.

So OPEC resolve seemed headed for a new test in 1990. Would members, facing a shrinking international call on their production, ratchet back to defend the crude oil price? Or would they produce as much as they could sell to defend market share and let prices fall where they might? It's a dilemma OPEC has confronted before — with varying degrees of success.

Whatever its immediate challenges as 1989 ended, OPEC could look ahead to better days. The well-established U.S. production slide seemed destined to be joined by a slump in the Soviet Union, the world's biggest oil producer. Soviet flow fell below 12 million barrels per day at times during 1989, a year in which official plans called for a significant increase. At the base of the production sputter were serious operating, bureaucratic, and financial difficulties. The U.S.S.R. seemed certain to have to reduce oil exports, a tough step for a country desperate for hard currency but a welcome one for OPEC. In addition to persistent questions about OPEC discipline, then, key variables in markets of the 1990s will be Soviet production and worldwide demand.

OPEC members behaved in 1989 as though they expected clearer sailing about the middle of the next decade. Having announced major reserve increases in recent years, the most important exporters turned their attention to production capacity. Iran and Iraq were rebuilding capacities ravaged by eight years of war. Also planning or contemplating capacity growth were Kuwait, the United Arab Emirates, Venezuela, and Saudi Arabia, where exploration resumed in 1989. In a yearend meeting, OPEC ministers paid more attention than usual to production capacity in determining quotas for 1990.

The new focus on production capacity, following disclosures of oil reserves significantly higher than earlier estimates, tells much about OPEC strategy and, therefore, future oil markets. The market-crushing production spree of 1986 may have reaped more damage than its OPEC engineers intended, but the strategy hasn't changed. The influential members of OPEC are serious about market share. They will surrender some degree of price today in order to produce as much oil tomorrow as they did yesterday — or more. And they understand that protecting market share means discouraging market entry by others, which means keeping a lid on price. With new capacity, they'll be able to restrain price by increasing production. And with 77% of worldwide oil reserves in excess of 1 trillion bbl, they'll possess the ability for a long time.

If OPEC can struggle through the challenges of 1990, and if demand doesn't turn strongly downward, greater stability is possible in the years ahead. And stability, at least diminished fear of another market crash, is essential to industry planning and prosperity.

One sign of stability appeared in 1989. Profitability spread more evenly across the petroleum industry's various segments. Thanks to slumping crude oil prices, downstream businesses — refining/marketing and petrochemicals — had provided most industry profits for several years. The pattern shows clearly in the "OGJ400" report in this volume, covering company performances for 1988.

In 1989, however, upstream activities began to recover in step with crude oil prices. Producing companies — streamlined from the rigors of 1986–88 — generally reported renewed profitability in 1989 or healthy profit boosts. Conversely, refining earnings sagged, although profitability remained the rule. The year-on-year crude price gains weren't matched by product prices, so refiners' margins narrowed, turning negative at times. Refinery utilization rates stayed high, however, restraining unit production costs and keeping refining operations profitable despite the thinner margins between crude and product values. That both upstream and downstream operations could make money at the same time, absent a shortage, was a welcome sign of balance at the end of a hectic decade.

Petrochemicals — the high-growth part of the business for several years — remained profitable through the first three quarters of 1989, but warning signs appeared. A worldwide olefins construction spree under way several years raised concerns of an impending capacity surplus. Plans for several major grassroots projects were scrapped. And some of the biggest petrochemical manufacturers said sales volumes and margins diminished during the course of the year.

On balance, business was good but not great for major oil companies unburdened with major restructuring debt or unusual charges, less so but improving for independents, and robust but worrisome for petrochemical manufacturers. Capital spending was up for companies reporting plans.

Drilling, however, didn't live up to expectations. The average Baker Hughes rig count ended the year at a modern record low of 869 in the U.S., down 67 from the previous year. The count outside the U.S. and Canada also lagged year-earlier levels, ending at an estimated average of 923 vs. 1,023 in 1988.

A better drilling year is in store worldwide in 1990. Half the active rigs in the U.S. in 1989 were drilling for gas. The U.S. winter started abnormally cold. Gas demand surged, which raised prices along with hopes for the long-awaited end of the gas deliverability surplus — the so-called bubble. The bubble's end will mean less to gas-on-gas competition, some degree of sustainable price strength, and consequently greater incentive to drill. Outside North America, drilling will pick up as the recent flurry of international licensing begins to produce results. *Oil & Gas Journal* projected an average U.S. rig count of 950 for 1990 and a count outside the U.S. and Canada of about the same.

All eyes, however, will remain on OPEC, oil product demand, and how those two central forces respond to one another. Keeping track of that interplay will keep the industry busy. And there are other concerns: How will the Exxon Valdez spill of 1989 affect tanker transportation of petroleum in the U.S. and elsewhere? How will nations deal with environmental problems — their own and the world's? How will oil and gas trade patterns change with barriers coming down in North America and Europe? What role will a newly restructured but still economically troubled Soviet Union play in future markets for crude oil, natural gas, and industry services and supplies?

This collection of data cannot answer questions like those in detail, crucial as they will be to the future shape of the petroleum world. The numbers can represent that world as it was in 1989, and — read carefully and critically — the course it was following into the 1990s and beyond.

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Managing Editor/Economics and Exploration
Oil & Gas Journal

OGJ SPECIAL

Downstream earnings boost 1988 profits of OGJ400 companies

Robert J. Beck
Economics Editor

Joan Biggs
OGJ Energy Database

Smaller but more profitable—that is the profile presented by the OGJ400 group of U.S. public oil and gas companies in fiscal 1988.

Total net income for the group reached $22.265 billion, up 138% from $9.372 billion in fiscal 1987. The jump was due to improvements downstream and the absence of huge restructuring and litigation losses in 1988.

This sharp increase in profits brought improvement in several measures of return on investment.

Other indicators of financial and operating performance were mixed as some reflected the continued sluggishness of the industry in 1988. But signs of renewed confidence included an increase in capital and exploratory spending, and in net wells drilled.

Again in 1988, strength in downstream operations—refining/marketing and petrochemical manufacturing—was the key reason for a sharp increase in operating earnings. As in the previous 2 years, companies with refining or petrochemical operations fared better than those that depend solely on oil and gas production.

Downstream profits were boosted by increased demand and improved margins. Crude prices were down again in 1988, lowering feedstock costs. And increased demand for petroleum and petrochemical products helped maintain strong product prices and widen operating margins.

In contrast, upstream earnings for the OGJ400 in fiscal 1988 were limited by the sharp drop in crude prices and lower U.S. crude production. The average wellhead price of crude in the U.S. fell 18.4% last year, and U.S. crude production fell 2.5%.

Wellhead natural gas prices, important to a recovery in drilling activity and upstream profits, also failed to gain.

Expectations of a modest improvement in upstream activity in 1988 never materialized. Crude prices were off slightly during the first part of the year, then dipped in the fourth quarter as OPEC exceeded production quotas.

The number of active drilling rigs in the U.S. averaged 936 in 1988, the same as the year before. Well completions fell 13% to 29,810.

But the OGJ400 group increased total capital and exploration spending 20.3% in 1988 and increased U.S. net wells drilled 5.2%. Integrated and international U.S. companies boosted investment in other sectors of the industry, and shifted investment outside the U.S.

The increase in net wells drilled by the group—while total well completions fell—reflects the continued depressed independent sector of the U.S. industry. The larger companies drilled a greater share of the wells.

Though crude prices strengthened in 1989, it has not led to a resurgence in exploration and drilling activity. Uncertainty still prevails in the upstream sector in the U.S.

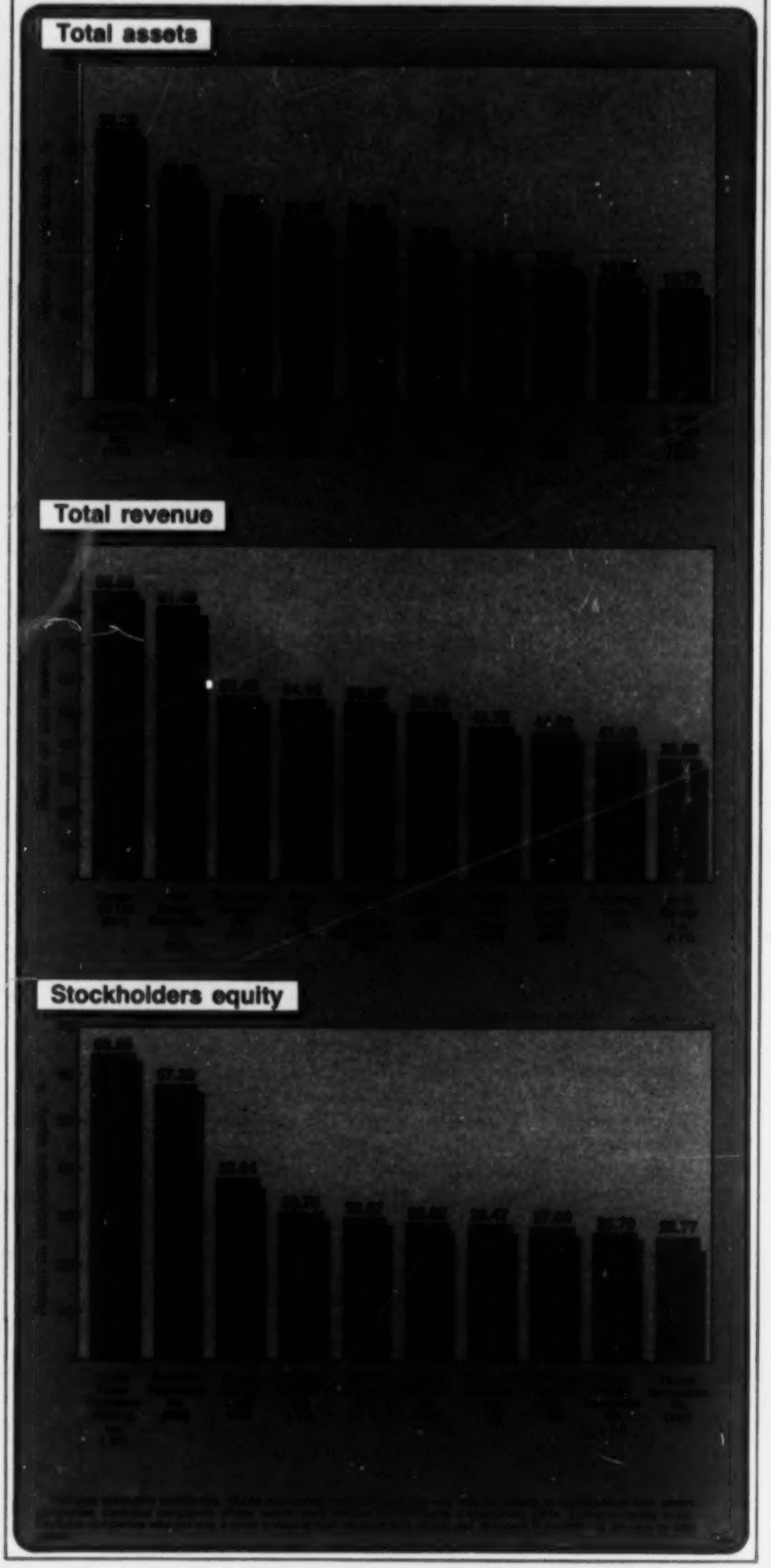
Higher crude prices this year have trimmed downstream earnings, but increased profits from production operations for the large integrated companies. Overall, their profits are running ahead of 1988 (OGJ, June 5, p. 36).

The surge in earnings in 1988—and continuing into 1989—is due in large part to increased product demand coupled with the massive restructuring of the past several years.

Companies have cut costs and reorganized to operate more efficiently, and their efforts are showing up in the bottom line.

The surge in profits for the OGJ400 group was

Top companies in return on...*



The top 20 in total revenue

Rank	Company	Total revenue, $ million
1	Exxon Corp.	88,563.0
2	Mobil Corp.	54,361.0
3	Texaco Inc.	35,138.0
4	Chevron Corp.	28,857.0
5	Amoco Corp.	23,919.0
6	Shell Oil Co.	21,399.0
7	Occidental Petroleum Corp.	19,417.0
8	ARCO (Atlantic Richfield Corp.)	18,868.0
9	BP America	16,661.0
10	Conoco Inc.	12,806.0
11	Phillips Petroleum Co.	11,490.0
12	Unocal Corp.	10,085.0
13	USX (Oil & Gas segment)	9,949.0
14	Ashland Oil Inc.	8,328.7
15	The Coastal Corp.	8,233.1
16	Enron Corp.	5,756.4
17	Amerada Hess Corp.	4,263.5
18	The Columbia Gas System Inc.	3,153.5
19	Transco Energy Co.	2,829.5
20	Enserch Corp.	2,738.5
	Total	398,816.3

in spite of a 2.9% drop in total revenues to $432.614 billion. In 1987 the group's revenues were $445.744 billion.

This is the second consecutive year that group net income has increased. Profits of the OGJ400 group fell from $29.9 billion in 1982 to a low of $5.2 billion in 1986. In 1988 half of the companies posted a profit; in 1986 only 116 of the 400 recorded a profit.

As a result of much healthier profits, the group recorded the highest return on revenues, 5.1%, since the OGJ400 was begun in 1982. This ratio was only 1.2% in 1986.

Return on assets jumped to 4.8% in 1988, the highest since 5.2% in 1983. It was only 1% in 1986. Return on stockholders equity moved up to 13.5%, the highest level since 13.8% in 1982. This measure of performance dropped to 3% in 1986.

Because of improved financial health, the group increased capital and exploration expenditures by 20.3% in 1988 to $50.1 billion. But this still indicates some caution about the future. Capital outlays were $66 billion in 1985.

The OGJ400 group of companies is constantly changing, so year-to-year comparisons are not for an identical group. But the group does describe a substantial portion of the domestic industry, and represents shifts and trends in industry activity and operating performance.

Here are highlights of the 1988 performance of the current OGJ400:

- Total assets of the group fell 6.5% to $468.4 billion, the lowest

Some key changes from 1988 OGJ400*

How company appeared on last year's list	Why change?	How company appears on this year's list
Apache Petroleum Co. LP	Restructured, name changed to............	Key Production Co. Inc.
Argosy Energy Inc.	Acquired by..............................	Garnet Resources
CSX Oil & Gas Corp.	Acquired by..............................	Total Minatome
Flag Redfern Oil Co.	Acquired by..............................	Kerr McGee
Kaneb Energy Partners Ltd.	Sold oil & gas properties to..............	AMAX Oil & Gas
Kaneb Services Inc.	Sold oil & gas properties to..............	AMAX Oil & Gas
Kirby Exploration Co.	Sold oil & gas assets to..................	American Exploration Co.
Newmont Oil Co.	Sold oil & gas properties to..............	Mobil Corp.
NUI Corp.	Non-utility spun-off into.................	KCS Group Inc.
Ossoco Inc.	Sold oil & gas properties to..............	American National Petroleum
Petroleum Reserve Corp.	Acquired by..............................	Castle Energy Corp.
Sabine Corp.	Acquired by..............................	Pacific Enterprises
Sun Co.	Spun-off, name changed to.................	Oryx Energy Co.
Walker Energy Partners	Acquired by..............................	Texas Meridian Resources
Western Energy Dev. Co.	Merged into...............................	Oxford Consolidated Inc.

The following companies sold all of their U.S. oil and gas assets during 1988 to private companies, companies not included in the OGJ400 or companies which could not be identified:

Graham-McCormick Oil & Gas Partners	Petromark Resources Co.	Tenneco Inc.
MCO Resources	Primark Corp.	Tidewater Inc.
Park-Ohio Industries Inc.	Pyro Energy Corp.	Total Petroleum(NA) Ltd.

* In addition to the above changes, 44 companies no longer rank among the top 400, 3 companies were taken private, 1 company is currently in Chapter 7, 4 companies are being liquidated, 8 no longer file 10Ks, and others have no 1988 data available yet, asked to be excluded or could not be located.

since the first OGJ400 report for fiscal 1982.

- Total revenues fell 2.9% to $432.6 billion. The group posted lower revenues only once, in 1986 at $422.3 billion.
- Net income gained 138% to $22.3 billion. Net income for the group was depressed in 1987 by Texaco's loss of $4.4 billion resulting from the outcome of the Pennzoil lawsuit. The highest net income for the OGJ400 was 1982 at $29.9 billion; it was $24.5 billion in 1984.
- Stockholders equity fell 4.9% to $164.3 billion in fiscal 1988; it was as high as $233.8 billion in 1983.
- Capital and exploratory spending gained 20.3% in 1988 to $50 billion as higher profits provided additional funds for investment.
- Liquids production was down for the group by 1.3% in the U.S. and 2.1% worldwide.
- Reserves changes were mixed. For the group, U.S. liquids reserves were down 1% while worldwide reserves were up 0.9%. Natural gas reserves were up 0.7% in the U.S. and 1.9% worldwide.

A changing group. The OGJ400 group changes along with industry restructuring and activity trends.

There are 68 new companies in this year's group. The number of limited partnerships increased to 71 from 63 last year, but there are seven royalty trusts included, the same as a year ago.

There are 28 companies that are subsidiaries of non-U.S. companies or of companies operating in another industry.

Last year's list included for the first time publicly held limited partnerships (LP's). For tax reasons, a number of drilling and income funds were converted in recent years to LP's. And a number of new LP's have been formed which are similar in function to income funds but are organized like limited partnerships.

Many of these have been created by investment firms with experience in oil and gas financing.

These firms have been included because they hold an increasing portion of U.S. reserves, and the partnership units are publicly held. Though the units are not publicly traded because a market has not been created, the LP's meet the criteria for the OGJ400—public companies with U.S. oil or gas reserves.

Mergers, consolidations, and changes in ownership of reserves continued in 1988. Some of the major changes are noted in the accompanying table.

A number of companies sold or spun off oil and gas operations and reserves in the search for their most profitable operating niche. Tenneco sold its oil and gas reserves, and Sun spun off its domestic U.S. exploration and production activities and created a new company, Oryx Energy.

This shifting of assets and reserves will likely continue for the forseeable future. Declining U.S. crude oil production and reserves, and relatively low prices, will be the key causes.

To be included in this year's list of 400 required assets of $251,000 compared to $646,000 last year. This may reflect consolidation in the industry

Fastest growing companies*

Rank by total assets	Company	Stockholders' equity 1988 ($1,000)	Stockholders' equity 1987 ($1,000)	% change	Net income 1988 ($1,000)	Net income 1987 ($1,000)	% change	Long-term debt 1988 ($1,000)	Long-term debt 1987 ($1,000)
18	Pennzoil Co.	1,290,848	316,359	308.0	1,475,442	45,514	3,141.7	1,414,757	1,439,280
67	Hadson Corp.	162,021	79,987	102.6	6,896	781	783.0	201,967	47,756
231	Arch Petroleum Inc.	3,089	1,626	90.0	330	303	8.9	42	894
192	Geodyne Resources, Inc.	12,914	7,113	81.6	7,389	4,463	65.6	228	1,579
15	The Coastal Corp.	1,271,900	859,800	47.9	157,400	113,100	39.2	3,100,300	3,508,800
171	Swift Energy Co.	15,769	10,871	45.1	4,678	4,024	16.3	0	0
135	Plains Petroleum Co.	34,244	25,270	35.5	9,825	9,570	2.7	10,000	4,446
10	Phillips Petroleum Co.	2,113,000	1,617,000	30.7	650,000	35,000	1,757.1	4,761,000	5,419,000
215	Brock Exploration Corp.	3,290	2,533	29.9	667	205	225.4	6,336	4,249
37	Union Texas Petroleum Holdings, Inc.	171,195	132,646	29.1	109,307	55,942	95.4	538,664	521,967
291	Southern Mineral Corp.	3,810	2,996	27.2	448	360	24.4	0	0
260	Panhandle Royalty Co.	5,657	4,555	24.2	939	508	84.8	0	0
221	Thor Energy Resources Inc.	7,742	6,288	23.1	1,664	2	83,100.0	3,231.0	273
13	Unocal Corp.	2,161,000	1,766,000	22.4	480,000	181,000	165.2	4,283,000	4,540,000
9	Occidental Petroleum Corp.	6,224,000	5,164,000	20.5	302,000	240,000	25.8	7,617,000	6,339,000
76	Petto Oil Co.	214,448	181,065	18.4	33,383	8,999	271.0	143,636	60,722
81	First Mississippi Corp.	186,442	158,606	17.6	32,475	18,610	74.5	3,415	57,704
203	Belcor Inc.	5,953	5,078	17.2	860	713	20.6	5,377	4,216
253	Whiting Petroleum Corp.	6,449	5,646	14.2	793	308	157.5	0	0
42	Freeport McMoRan Energy Partners	897,290	790,948	13.4	25,102	13,508	85.8	237,441	170,651

* Companies were selected on the basis of growth in stockholders' equity. Only companies with positive net income for both 1987 and 1988 were considered. Companies were not considered if they had a decline in net income for 1988, were subsidiaries of another company, or became public within the last year.

The top 20 in net income and in stockholders' equity

Rank	Company	Net income, $ million
1	Exxon Corp.	5,260.0
2	BP America	2,129.0
3	Mobil Corp.	2,087.0
4	Amoco Corp.	2,063.0
5	Chevron Corp.	1,768.0
6	ARCO (Atlantic Richfield Corp.)	1,583.0
7	Pennzoil Co.	1,475.4
8	Texaco Inc.	1,304.0
9	Shell Oil Co.	1,239.0
10	Phillips Petroleum Co.	650.0
11	Unocal Corp.	480.0
12	Conoco Inc.	391.0
13	Freeport-McMoRan Inc.	310.1
14	Occidental Petroleum Corp.	302.0
15	Union Pacific Resources Co.	228.0
16	Ashland Oil Inc.	223.9
17	Consolidated Natural Gas Co.	192.9
18	Union Exploration Partners Ltd.	189.4
19	The Coastal Corp.	157.4
20	American Petrofina Inc.	132.9
	Total	22,198.1

Rank	Company	Stockholders' equity, $ million
1	Exxon Corp.	31,767.0
2	Mobil Corp.	15,686.0
3	Shell Oil Co.	15,381.0
4	Chevron Corp.	14,788.0
5	Amoco Corp.	13,342.0
6	Texaco Inc.	8,105.0
7	ARCO (Atlantic Richfield Corp.)	6,247.0
8	Occidental Petroleum Corp.	6,224.0
9	USX (Oil & Gas segment)	4,347.0
10	Amerada Hess Corp.	2,215.1
11	Unocal Corp.	2,161.0
12	Phillips Petroleum Co.	2,113.0
13	Meridian Oil Inc.	1,842.0
14	Enron Corp.	1,637.0
15	Consolidated Natural Gas Co.	1,634.7
16	Oryx Energy Co.	1,611.0
17	The Columbia Gas System Inc.	1,552.6
18	Kerr-McGee Corp.	1,422.0
19	Pennzoil Co.	1,290.8
20	The Coastal Corp.	1,271.9
	Total	134,638.2

but this cutoff tends to fluctuate greatly, ranging from $149,000 in 1986 to $2,366,000 in 1983.

The asset value to make the top 100 companies fell to $154 million from $203 million last year.

The number of companies posting net income of $100 million or more moved up to 28 compared to 21 last year; six companies had a net loss of $100 million or more.

Group top 20. The top 20 companies of the OGJ400 account for a substantial portion of the group total. But there does not appear to be an increase in concentration of assets among the top 20 companies. There were three new companies in the top 20 list this year: Pennzoil, Ashland, and Consolidated Natural Gas.

The top 20 companies, ranked by assets, had total assets of $378.3 billion in 1988, 80.75% of the total for the OGJ400 group. Assets of the leading 20 firms were down 6.6% from $405 billion in 1987.

This top group posted revenues of $386 billion in 1988, 89.2% of the total. These 20 leaders made most of the profit posted by the group; net income of $21.8 billion was 97.8% of the total net income for the OGJ400.

Stockholders equity for the top 20 was $130.9 billion, 79.7% of the total. They accounted for $37.7 billion in capital and exploration spending, 75.3% of the total.

During 1988 the top 20 drilled 5,751 net wells, 57.3% of the OGJ400 total. Last year the top 20 companies drilled 5,839 wells, which represented 61.7% of the total.

The top 20 companies also dominate the production and reserves statistics for the group. They accounted for 88% of the worldwide and 84% of the U.S. liquids production; and 73% of worldwide and 67% of U.S. natural gas production.

They hold 90% of the group's worldwide liquids reserves and 87% of its U.S. liquids reserves. The top 20 companies have 75% of the group's worldwide and 67% of its U.S. natural gas reserves.

The OGJ400 share. The OGJ400 group's total revenue of $432.6 billion was equal to 8.9% of U.S. gross national product in 1988. This was down from revenue of $445.7 billion and 9.8% of GNP in 1987.

These 400 firms also account for a substantial share of total U.S. oil and gas production and reserves: 66% of liquids reserves, 62% of natural gas reserves; 64% of liquids production and 58% of natural gas production.

Worldwide, the figures aren't quite as impressive since the OPEC countries and national oil companies dominate reserves and production. The group holds 4% of worldwide liquids and natural gas reserves.

In 1988 it accounted for 17% of worldwide liquids production and

The top 20 in spending and U.S. net wells drilled

Rank	Company	Capital exploratory spending, $ million
1	Exxon Corp.	7,508.0
2	Mobil Corp.	3,915.0
3	Amoco Corp.	3,697.0
4	Shell Oil Co.	3,318.0
5	ARCO (Atlantic Richfield Corp.)	3,038.0
6	BP America	2,496.0
7	Chevron Corp.	2,459.0
8	Texaco Inc.	2,435.0
9	Conoco Inc.	2,069.0
10	Unocal Corp.	1,193.0
10	Occidental Petroleum Corp.	1,193.0
12	USX (Oil & Gas segment)	981.0
13	Oryx Energy Co.	812.0
14	Phillips Petroleum Co.	797.0
15	Mesa L.P.	770.9
16	Amerada Hess Corp.	729.9
17	Freeport-McMoRan Inc.	722.5
18	Total Minatome Corp.	658.3
19	Pacific Enterprises Oil & Gas Co.	600.0
20	Consolidated Natural Gas Co.	512.5
	Total	[illegible]

Rank	Company	U.S. net wells drilled
1	Shell Oil Co.	883.0
2	Amoco Corp.	607.0
3	Mobil Corp.	568.0
4	Texaco Corp.	532.0
5	Exxon Corp.	502.0
6	ARCO (Atlantic Richfield Corp.)	462.0
7	USX (Oil & Gas segment)	448.0
8	Oryx Energy Co.	347.0
9	Chevron Corp.	342.0
10	Meridian Oil Inc.	260.7
11	Pacific Enterprises Oil & Gas Co.	250.6
12	Consolidated Natural Gas Co.	250.0
13	Unocal Corp.	231.0
14	Occidental Petroleum Corp.	217.1
15	Union Pacific Resources Co.	210.0
16	Equitable Resources Inc.	192.8
17	Conoco Inc.	190.5
18	Phillips Petroleum Co.	169.0
19	Anadarko Petroleum Corp.	166.6
20	Cabot Corp.	153.2
	Total	6,982.5

The top 20 in liquids reserves

Rank	Company	U.S. liquids reserves, million bbl
1	Shell Oil Co.	2,851.0
2	ARCO (Atlantic Richfield Co.)	2,829.0
3	BP America	2,678.0
4	Exxon Corp.	2,630.0
5	Chevron Corp.	1,806.0
6	Amoco Corp.	1,736.0
7	Texaco Inc.	1,623.0
8	Mobil Corp.	1,140.0
9	Unocal Corp.	639.0
10	Oryx Energy Co.	601.0
11	USX (Oil & Gas segment)	597.9
12	Phillips Petroleum Co.	445.0
13	Conoco Inc.	392.0
14	Union Exploration Partners Ltd.	216.0
15	Occidental Petroleum Corp.	205.0
15	Amerada Hess Corp.	205.0
17	Santa Fe Energy Co.	183.7
18	Pennzoil Co.	134.0
19	Union Pacific Resources Co.	133.9
20	Mesa L.P.	99.7
	Total	**21,145.3**

Rank	Company	Worldwide liquids reserves, million bbl
1	Exxon Corp.	6,551.0
2	Chevron Corp.	3,317.0
3	ARCO (Atlantic Richfield Co.)	3,093.0
4	Shell Oil Co.	3,058.0
5	Texaco Inc.	2,992.0
6	Amoco Corp.	2,798.0
7	BP America	2,752.0
8	Mobil Corp.	2,553.0
9	Unocal Corp.	1,520.0
10	Conoco Inc.	1,036.0
11	Phillips Petroleum Co.	934.0
12	USX (Oil & Gas Segment)	794.0
13	Occidental Petroleum Corp.	723.0
14	Oryx Energy Co.	601.0
15	Amerada Hess Corp.	572.0
16	Union Exploration Partners Ltd.	216.0
17	Maxus Energy Corp.	200.4
18	Santa Fe Energy Co.	183.7
19	Union Pacific Resources Co.	152.5
20	Pennzoil Co.	137.0
	Total	**34,183.6**

The top 20 in gas reserves

Rank	Company	U.S. gas reserves, bcf
1	Amoco Corp.	12,371.0
2	Exxon Corp.	9,341.0
3	Chevron Corp.	8,274.0
4	Mobil Corp.	7,515.0
5	ARCO (Atlantic Richfield Corp.)	6,373.0
6	Shell Oil Co.	6,248.0
7	Texaco Inc.	4,655.0
8	Unocal Corp.	4,320.0
9	Meridian Oil Inc.	3,804.0
10	Phillips Petroleum Corp.	3,365.0
11	USX (Oil & Gas segment)	3,047.7
12	Occidental Petroleum Corp.	2,568.0
13	Union Exploration Partners Ltd.	2,480.0
14	BP America	2,273.0
15	Mesa L.P.	2,251.3
16	Oryx Energy Co.	2,242.0
17	Conoco Inc.	2,154.0
18	Anadarko Petroleum Corp.	1,703.9
19	Union Pacific Resources Co.	1,384.0
20	Enron Corp.	1,199.2
	Total	**87,569.1**

Rank	Company	Worldwide gas reserves, bcf
1	Exxon Corp.	22,797.0
2	Mobil Corp.	19,637.0
3	Amoco Corp.	19,487.0
4	Chevron Corp.	10,710.0
5	ARCO (Atlantic Richfield Corp.)	7,622.0
6	Texaco Inc.	7,238.0
7	Shell Oil Co.	6,583.0
8	Unocal Corp.	6,137.0
9	Phillips Petroleum Co.	5,509.0
10	USX (Oil & Gas segment)	4,655.2
11	BP America	4,223.0
12	Meridian Oil Inc.	3,804.0
13	Conoco Inc.	3,624.0
14	Occidental Petroleum Corp.	2,920.0
15	Union Exploration Partners Ltd.	2,480.0
16	Mesa L.P.	2,251.3
17	Oryx Energy Co.	2,242.0
18	Amerada Hess Corp.	2,136.0
19	Anadarko Petroleum Corp.	1,761.8
20	Union Texas Petroleum Holdings, Inc.	1,626.3
	Total	**137,443.6**

The top 20 in liquids production

Rank	Company	U.S. liquids production, million bbl
1	BP America	314.0
2	Exxon Corp.	278.0
3	ARCO (Atlantic Richfield Corp.)	246.0
4	Shell Oil Co.	193.0
5	Texaco Inc.	192.0
6	Chevron Corp.	177.0
7	Amoco Corp.	149.0
8	Mobil Corp.	111.0
9	Unocal Corp.	64.0
10	Oryx Energy Co.	57.0
11	USX (Oil & Gas segment)	56.4
12	Phillips Petroleum Co.	50.0
13	Conoco Inc.	39.0
14	Meridian Oil Inc.	30.0
15	Occidental Petroleum Corp.	25.0
15	Amerada Hess Corp.	25.0
17	Union Pacific Resources Co.	23.3
18	Santa Fe Energy Co.	19.5
19	Union Exploration Partners Ltd.	19.0
20	Mitchell Energy & Development Corp.	15.0
	Total	**2,083.2**

Rank	Company	Worldwide liquids production, million bbl
1	Exxon Corp.	660.0
2	Texaco Inc.	329.0
3	Chevron Corp.	321.0
4	BP America	315.0
5	Amoco Corp.	293.0
6	ARCO (Atlantic Richfield Corp.)	269.0
7	Mobil Corp.	237.0
8	Shell Oil Co.	218.0
9	Conoco Inc.	131.0
10	Unocal Corp.	97.0
11	Phillips Petroleum Co.	95.0
12	Occidental Petroleum Corp.	85.0
13	USX (Oil & Gas segment)	81.4
14	Oryx Energy Co.	57.0
15	Amerada Hess Corp.	53.0
16	Meridian Oil Inc.	30.0
17	Union Pacific Resources Co.	24.3
18	Maxus Energy Corp.	21.0
19	Santa Fe Energy Co.	19.5
20	Union Exploration Partners Ltd.	19.0
	Total	**3,355.2**

The top 20 in gas production

Rank	Company	U.S. gas production, bcf
1	Texaco Inc.	780.0
2	Exxon Corp.	751.0
3	Chevron Corp.	740.0
4	Mobil Corp.	658.0
5	Amoco Corp.	605.0
6	Shell Oil Co.	581.0
7	ARCO (Atlantic Richfield Corp.)	508.0
8	USX (Oil & Gas segment)	313.5
9	Phillips Petroleum Co.	312.0
10	Occidental Petroleum Corp.	282.0
11	Unocal Corp.	276.0
12	Oryx Energy Co.	247.0
13	Conoco Inc.	238.0
14	Meridian Oil Inc.	162.3
15	Union Exploration Partners Ltd.	144.0
16	Union Pacific Resources Co.	138.0
17	Consolidated Natural Gas Co.	136.0
18	Anadarko Petroleum Corp.	128.5
19	Pennzoil Co.	124.0
20	BP America	123.0
	Total	7,247.4

Rank	Company	Worldwide gas production, bcf
1	Mobil Corp.	1,519.0
2	Exxon Corp.	1,514.0
3	Amoco Corp.	1,066.0
4	Texaco Inc.	912.0
5	Chevron Corp.	839.0
6	Shell Oil Co.	590.0
7	ARCO (Atlantic Richfield Corp.)	564.0
8	Unocal Corp.	448.0
8	Phillips Petroleum Co.	448.0
10	USX (Oil & Gas segment)	411.6
11	Conoco Inc.	327.0
12	Occidental Petroleum Corp.	308.0
13	Oryx Energy Co.	247.0
14	Amerada Hess Corp.	186.0
15	Meridian Oil Inc.	162.3
16	Union Pacific Resources Co.	145.0
17	Union Exploration Partners Ltd.	144.0
18	Consolidated Natural Gas Co.	136.0
19	BP America	135.0
20	Union Texas Petroleum Holdings, Inc.	132.3
	Total	10,234.3

19% of natural gas production. This represented 23% of non-Communist liquids production and 33% of gas production.

Fastest growing firms. Ranking on the list of the fastest growing companies is based on growth in stockholders equity. To qualify companies must have had positive net income for both 1988 and 1987 and an increase in net income in 1988.

Subsidiary companies and newly public companies are not included.

All of the companies on the list posted substantial gains in net income in 1988. The long term debt positions of these companies were mixed. Phillips, Unocal, and Coastal substantially reduced their long term debt in 1988. But Occidental added considerably to its debt position.

Pennzoil jumped to the top of the list of fast growers this year, thanks to the settlement with Texaco. Its net income went from $45.5 million in 1987 to $1.475 billion in 1988.

Five of the companies were also on last year's list of fastest growing companies: Hadson Corp., Coastal, Swift Energy, Plains Petroleum, and Occidental Petroleum.

OGJ100. For the first time, this year's report presents financial and operating information from major non-U.S. oil and gas companies around the world. This list has been prepared to make it possible to compare the size and performance of prominent individual companies.

The information available for this initial survey is not complete for all of the companies. Many of the state oil and gas companies report only production and reserves information, not financial data. For this reason, the companies have not been ranked but instead are listed by region based on the location of the corporate headquarters. As additional information becomes available, it will be possible to rank the companies.

OGJ has listed the top twenty companies in this year's initial group according to crude oil production and reserves. As would be expected these lists are dominated by the state oil companies from the major producing countries.

The leading non-government controlled company in both reserves and production is Royal Dutch/Shell.

The major international oil companies headquartered in the U.S. have not been included in the OGJ100 list, but some would rank in the top 20. If they were included, Exxon would rank 5th in worldwide production—slightly ahead of Shell.

Other U.S. companies that would make the top 20 list in terms of worldwide liquids production are Texaco, Chevron, Amoco, Arco, and Mobil.

In worldwide liquid reserves, Exxon would rank 10th. The list would also include Chevron, Arco, and Texaco.▪

OGJ100: reserves and production leaders

Rank	Company	Reserves, million bbl
1	Arabian American Oil Co.	169,970.0
2	Iraq National Oil Co.	100,000.0
3	National Iranian Oil Co.	92,850.0
4	Abu Dhabi National Oil Co.	92,205.0
5	Kuwait Oil Co.	91,920.0
6	Petroleos de Venezuela SA	58,504.0
7	Petroleos Mexicanos	53,012.0
8	Royal Dutch/Shell	8,839.0
9	Sonatrach (Algeria)	8,400.0
10	Oil and Natural Gas Commission (India)	6,354.0
11	British Petroleum Co. plc	5,224.0
12	Ente Nazionale Idrocarburi (Italy)	4,573.9
13	Petroleum Development Oman	4,071.0
14	Dubai Petroleum Co.	4,000.0
15	Qatar General Pet. Corp.	3,150.0
16	Petronas (Malaysia)	2,900.0
17	Petroleo Brasilieiro SA	2,816.0
18	Yacimentos Petroliferos Fiscales SE (Argentina)	2,268.0
19	Syrian Petroleum Co.	1,730.0
20	Imperial Oil Ltd. (Canada)	1,631.0
	Total	714,417.9

Rank	Company	Production, million bbl
1	Arabian American Oil Co.	1,803.7
2	Iraq National Oil Co.	983.8
3	Petroleos Mexicanos	917.4
4	National Iranian Oil Co.	819.8
5	Royal Dutch/Shell	645.3
6	Petroleos de Venezuela SA	627.7
7	British Petroleum Co. plc	567.3
8	Kuwait Oil Co.	439.2
9	Abu Dhabi National Oil Co.	378.6
10	Nigerian National Petrol. Corp.	340.4
11	National Oil Corp. (Libya)	325.6
12	Oil and Natural Gas Commission (India)	232.0
13	Soc. Nat. Elf Aquitaine	232.0
14	Sonatrach (Algeria)	228.4
15	Petroleum Development Oman	221.4
16	Pertamina (Indonesia)	218.3
17	Petroleo Brasilieiro SA	211.2
18	Petronas (Malaysia)	191.1
19	Yacimentos Petroliferos Fiscales SE (Argentina)	161.1
20	Dubai Petroleum Co.	132.8
	Total	9,677.0

Rank by total assets 1988	Rank by total assets 1987	Company	Total assets $000	Total revenue Rank	Total revenue $000	Net income Rank	Net income $000	Stockholders' equity Rank	Stockholders' equity $000	Capital & expl. spending Rank	Capital & expl. spending $000
1	1	Exxon Corp.	74,293,000	1	88,563,000	1	5,260,000	1	31,767,000	1	7,508,000
2	2	Mobil Corp.	38,820,000	2	54,361,000	3	2,087,000	2	15,686,000	2	3,915,000
3	3	Chevron Corp.	33,968,000	4	28,857,000	5	1,768,000	4	14,788,000	7	2,459,000
4	6	Amoco Corp.	29,919,000	5	23,919,000	4	2,063,000	5	13,342,000	3	3,697,000
5	5	Shell Oil Co.	27,169,000	6	21,399,000	9	1,239,000	3	15,381,000	4	3,318,000
6	4	**Texaco Inc.**	26,337,000	3	35,138,000	8	1,304,000	6	8,105,000	8	2,435,000
7	7	**BP America**[1]	22,452,000	9	16,661,000	2	[2]2,129,000	—	NA	6	2,496,000
8	8	**ARCO (Atlantic Richfield Corp.)**	21,514,000	8	18,868,000	6	1,583,000	7	6,247,000	5	3,038,000
9	10	**Occidental Petroleum Corp.**	20,747,000	7	19,417,000	14	302,000	8	6,224,000	10	1,193,000
10	12	**Phillips Petroleum Co.**	11,968,000	11	11,490,000	10	650,000	12	2,113,000	14	797,000
11	13	USX (Oil & Gas segment)[3]	11,450,000	13	9,949,000	24	116,000	9	4,347,000	12	981,000
12	16	Conoco Inc.[4]	9,736,000	10	12,806,000	12	[5]391,000	—	NA	9	2,069,000
13	14	Unocal Corp.	9,508,000	12	10,085,000	11	480,000	11	2,161,000	11	1,193,000
14	15	Enron Corp.	8,694,808	16	5,756,352	27	108,969	14	1,637,001	29	293,628
15	17	The Coastal Corp.	7,865,300	15	8,233,100	19	157,400	20	1,271,900	39	196,800
16	18	**The Columbia Gas System Inc.**	5,641,000	18	3,153,500	22	119,000	17	1,552,600	27	298,800
17	19	**Amerada Hess Corp.**	5,371,979	17	4,263,544	21	124,217	10	2,215,154	16	729,929
18	24	**Pennzoil Co.**[6]	4,479,602	24	2,273,900	7	1,475,442	19	1,290,848	35	227,411
19	21	**Ashland Oil Inc.**[9]	4,254,486	14	8,328,732	16	223,944	21	1,120,981	24	351,653
20	22	**Consolidated Natural Gas Co.**	4,109,439	23	2,482,951	17	192,879	15	1,634,770	20	512,500
21	—	Oryx Energy Co.[11]	4,094,000	31	1,286,000	400	(305,000)	16	1,611,000	13	812,000
22	25	Freeport-McMoRan Inc.	3,729,772	26	1,944,638	13	310,132	22	1,089,480	17	722,536
23	20	Transco Energy Co.	3,527,190	19	2,829,554	394	(76,848)	39	534,167	44	160,119
24	29	Arkla, Inc.	3,248,844	25	2,022,812	23	117,277	28	840,328	37	213,493
25	26	Sonat Inc.	3,138,482	30	1,392,384	29	97,804	23	1,082,448	22	381,587
26	27	**Kerr-McGee Corp.**	3,123,000	21	2,713,000	25	110,000	18	1,422,000	23	361,000
27	28	**Mesa L.P.**	3,000,439	51	422,755	35	46,089	25	[12]953,143	15	770,944
28	23	**Enserch Corp.**	2,970,119	20	2,738,508	397	(166,444)	33	738,463	38	206,595
29	30	**Meridian Oil Inc.**[13]	2,808,377	39	750,264	32	55,485	13	1,841,951	21	411,690
30	37	**American Petrofina Inc.**	2,355,823	22	2,651,159	20	132,900	29	830,303	34	240,668
31	33	NICOR Inc.	2,099,700	29	1,524,200	28	106,100	36	598,400	41	176,900
32	32	Murphy Oil Corp.	2,068,217	28	1,524,773	38	38,752	32	761,404	32	250,158
33	31	Mitchell Energy & Development Corp.[14]	1,996,304	47	577,231	49	21,537	37	567,153	45	158,139
34	36	The Montana Power Co.	1,926,483	42	726,028	30	71,862	30	774,248	61	73,656
35	35	Union Pacific Resources Co.[15]	1,873,000	36	823,000	15	228,000	27	854,000	25	323,000
36	34	**Maxus Energy Corp.**	1,719,800	46	600,200	395	(131,600)	138	25,400	43	160,300
37	38	**Union Texas Petroleum Holdings, Inc.**	1,716,768	34	1,151,956	26	109,307	67	171,195	26	309,407
38	42	**Cabot Corp.**[9]	1,543,233	27	1,686,272	31	60,359	35	607,342	40	186,959
39	40	**Union Exploration Partners Ltd.**[16]	1,494,500	44	640,300	18	189,400	24	1,078,500	33	245,500
40	43	**Anadarko Petroleum Corp.**	1,489,970	55	336,969	37	39,774	43	455,238	42	161,485
41	39	Louisiana Land & Exploration Co.	1,428,900	41	726,300	386	(33,300)	41	489,200	30	267,000
42	49	Freeport McMoRan Energy Partners[17]	1,333,739	59	233,689	47	25,102	26	[12]897,290	52	107,369
43	47	National Fuel Gas Co.[9]	1,176,878	37	773,800	36	42,636	47	406,104	48	127,901
44	45	BHP Petroleum (Americas) Inc.[18]	1,151,331	69	173,109	398	(194,160)	34	657,386	49	119,049
45	74	Pacific Enterprises Oil & Gas Co.[19]	1,119,000	61	228,000	40	35,000	40	518,000	19	[20]600,000
46	54	**Equitable Resources Inc.**	1,069,193	52	407,920	34	47,144	42	477,767	54	97,562
47	51	**Questar Corp.**[21]	1,026,077	49	489,977	46	25,851	44	451,089	57	79,394
48	53	**Ocean Drilling & Exploration Co.**[22]	1,025,728	53	406,006	385	(30,440)	45	433,052	53	99,329
49	50	**Santa Fe Energy Co.**[23]	1,021,700	56	288,700	379	[24](17,400)	—	NA	50	116,000
50	46	**Enserch Exploration Partners Ltd.**[25]	1,006,864	60	228,759	33	47,206	31	[12]770,618	46	140,051
51	56	**ONEOK Inc.**[26]	958,090	48	571,434	48	21,656	51	327,148	78	39,596

Worldwide liquids production		Worldwide natural gas production		Worldwide liquids reserves		Worldwide natural gas reserves		U.S. liquids production		U.S. natural gas production		U.S. liquids reserves		U.S. natural gas reserves		U.S. net wells drilled	
Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Wells
1	660.0	2	1,514.0	1	6,551.0	1	22,797.0	2	278.0	2	751.0	4	2,630.0	2	9,341.0	5	502.0
7	237.0	1	1,519.0	8	2,553.0	2	19,637.0	8	111.0	4	658.0	8	1,140.0	4	7,515.0	3	568.0
3	321.0	5	839.0	2	3,317.0	4	10,710.0	6	177.0	3	740.0	5	1,806.0	3	8,274.0	9	342.0
5	293.0	3	1,066.0	6	2,798.0	3	19,487.0	7	149.0	5	605.0	6	1,736.0	1	12,371.0	2	607.0
8	218.0	6	590.0	4	3,058.0	7	6,583.0	4	193.0	6	581.0	1	2,851.0	6	6,248.0	1	883.0
2	329.0	4	912.0	5	2,992.0	6	7,238.0	5	192.0	1	780.0	7	1,623.0	7	4,655.0	4	532.0
4	315.0	19	135.0	7	2,752.0	11	4,223.0	1	314.0	20	123.0	3	2,678.0	14	2,273.0	—	NA
6	269.0	7	564.0	3	3,093.0	5	7,622.0	3	246.0	7	508.0	2	2,829.0	5	6,373.0	6	462.0
12	85.00	12	308.0	13	723.0	14	2,920.0	15	25.00	10	282.0	15	205.0	12	2,568.0	14	217.1
11	95.00	8	448.0	11	934.0	9	5,509.0	12	50.00	9	312.0	12	445.0	10	3,365.0	18	169.0
13	81.44	10	411.6	12	794.0	10	4,655.2	11	56.41	8	313.5	11	597.9	11	3,047.7	7	448.0
9	131.0	11	327.0	10	1,036.0	13	3,624.0	13	39.00	13	238.0	13	392.0	17	2,154.0	17	190.5
10	97.00	9	448.0	9	1,520.0	8	6,137.0	9	64.00	11	276.0	9	639.0	8	4,320.0	13	231.0
40	4.302	22	127.4	42	30.13	22	1,282.8	41	3.388	21	121.9	43	23.90	20	1,199.2	24	[6]96.97
43	3.748	40	[7]52.74	47	25.55	42	[7]536.3	37	3.748	39	[7]52.74	41	25.55	37	[7]536.3	59	25.30
55	2.328	32	74.60	57	14.90	30	897.8	57	1.637	29	72.20	72	8.245	26	742.2	44	41.00
15	53.00	14	186.0	15	572.0	18	2,136.0	16	25.00	23	103.0	16	205.0	25	778.0	41	45.00
27	11.00	23	127.0	20	137.0	28	944.0	21	11.00	19	124.0	18	134.0	24	891.0	23	107.5
26	12.20	72	15.00	35	47.70	66	212.1	79	0.900	66	15.00	131	2.400	61	212.1	52	34.00
34	[10]5.300	18	[10]136.0	37	[10]40.22	23	[10]1,188.0	30	[6,10]5.300	17	[6,10]136.0	31	[6,10]40.22	21	[6,10]1,188.0	12	250.0
14	57.00	13	247.0	14	601.0	17	2,242.0	10	57.00	12	247.0	10	601.0	16	2,242.0	8	347.0
29	7.700	28	83.20	28	75.90	26	1,003.7	24	7.300	28	73.20	25	67.10	27	741.1	29	66.16
45	3.451	52	39.12	61	13.59	51	339.2	40	3.451	50	39.12	54	13.59	47	339.2	68	21.70
39	4.640	35	56.82	103	5.552	36	675.1	34	4.640	33	56.82	92	5.552	31	675.1	35	57.20
53	2.645	45	47.00	84	7.019	53	334.0	48	2.645	42	47.00	78	7.019	48	334.0	45	38.40
25	14.10	27	95.60	23	93.50	32	784.0	26	6.400	25	84.80	30	42.40	33	645.8	62	23.14
33	6.279	24	116.4	22	99.7	16	2,251.3	28	6.279	22	116.4	20	99.7	15	2,251.3	25	92.20
48	2.977	33	71.21	43	29.43	25	1,008.7	49	2.625	30	71.21	38	26.23	23	1,001.1	42	45.00
16	30.01	15	162.3	25	87.70	12	3,804.0	14	30.01	14	162.3	21	87.70	9	3,804.0	10	260.7
32	6.321	48	41.78	33	56.34	34	687.8	27	6.321	45	41.78	27	56.34	30	687.8	36	51.80
76	1.100	68	16.80	109	4.900	82	126.9	70	1.100	62	16.80	100	4.900	73	126.9	81	15.40
21	17.50	31	75.70	24	90.20	37	661.2	29	5.700	32	61.20	34	27.50	44	373.7	75	17.00
24	15.00	37	54.10	27	84.60	41	555.6	20	15.00	35	54.10	22	84.60	36	555.6	26	79.75
101	0.653	66	18.01	111	4.683	47	381.7	114	0.406	79	9.444	143	1.948	74	122.9	78	15.92
17	24.30	16	145.0	19	152.5	21	1,517.7	17	23.30	16	138.0	19	133.9	19	1,384.0	15	210.0
18	21.00	25	113.8	17	200.4	31	789.5	35	4.565	24	102.0	33	31.76	29	689.4	34	57.70
22	15.88	20	132.3	21	115.7	20	1,626.3	38	3.623	36	54.06	39	25.77	43	391.0	27	67.04
70	1.272	53	37.95	85	7.015	43	533.6	63	1.272	51	37.95	79	7.015	38	533.6	20	153.2
20	19.00	17	144.0	16	216.0	15	2,480.0	19	19.00	15	144.0	14	216.0	13	2,480.0	40	49.00
42	4.004	21	130.8	49	21.77	19	1,761.8	39	3.475	18	128.5	47	17.76	18	1,703.9	19	166.6
23	15.50	26	96.70	26	84.90	35	676.5	22	10.00	27	76.10	29	46.10	41	446.8	43	44.50
31	6.634	34	69.74	30	67.14	33	741.1	25	6.634	31	69.74	24	67.14	28	741.1	30	66.16
115	0.517	75	13.85	68	11.67	80	131.7	107	[6]0.517	68	[6]13.85	60	[6]11.67	71	[6]131.7	22	114.0
37	4.700	41	50.00	31	62.30	38	647.0	32	4.700	40	50.00	26	62.30	32	647.0	32	63.00
28	9.585	46	43.41	29	74.63	56	325.5	23	8.514	47	40.92	23	[6]74.63	49	[6]325.5	11	250.6
64	1.430	50	41.07	73	9.785	39	609.2	59	1.430	46	41.07	67	9.785	34	609.2	16	192.8
51	2.893	56	31.84	58	[10]14.89	44	[10]480.5	46	2.893	54	31.84	51	[10]14.89	39	[10]480.5	73	19.00
30	7.325	43	47.87	40	31.75	55	331.3	47	2.789	43	45.11	66	10.13	53	276.0	102	7.340
19	19.50	55	33.80	18	183.7	69	191.6	18	19.50	53	33.80	17	183.7	64	191.6	21	125.3
54	2.605	29	81.12	45	26.41	24	1,141.0	50	2.605	26	81.12	37	26.41	22	1,141.0	37	51.70
108	0.612	78	12.69	134	2.492	89	98.66	99	0.612	71	12.69	129	2.492	80	98.66	94	9.772

Rank by total assets 1988	Rank by total assets 1987	Company	Total assets $000	Total revenue Rank	Total revenue $000	Net income Rank	Net income $000	Stockholders' equity Rank	Stockholders' equity $000	Capital & expl. spending Rank	Capital & expl. spending $000
52	85	Total Minatome Corp.[27]	933,496	77	141,922	393	(70,935)	98	70,690	18	658,349
53	57	Grace Natural Resources Group[28]	[29]906,000	50	440,900	41	35,000	—	NA	68	60,200
54	48	Transco Exploration Partners[30]	880,554	72	161,899	391	(48,622)	38	[12]556,225	62	73,417
55	55	Hamilton Oil Corp.	838,457	62	208,620	45	29,323	53	289,860	59	76,686
56	58	Diversified Energies, Inc.	819,246	38	766,349	39	38,249	55	273,962	55	93,407
57	59	Zapata Corp.[9]	771,412	63	196,484	388	(36,659)	385	(11,662)	80	34,584
58	**64**	**Quaker State Corp.**	**739,894**	**35**	**877,445**	**56**	**14,933**	**52**	**314,733**	**73**	**[31]47,312**
59	**69**	**Apache Corp.**	**701,667**	**78**	**141,512**	**67**	**9,040**	**63**	**206,941**	**75**	**44,807**
60	**44**	**Global Marine Inc.[32]**	**695,800**	**75**	**152,600**	**396**	**(155,600)**	**87**	**81,100**	**123**	**11,800**
61	**76**	**Sunshine Mining Co.**	**678,036**	**86**	**82,850**	**392**	**(54,017)**	**73**	**133,448**	**96**	**19,056**
62	**62**	**Cenex, Farmer's Union Central Exchange, Inc.[9]**	**606,016**	**32**	**1,259,355**	**61**	**11,303**	**54**	**285,339**	**117**	**13,056**
63	61	Reading & Bates Corp.[33]	581,484	82	109,939	399	(217,872)	391	(282,596)	138	7,874
64	70	Triton Energy Corp.[18]	579,876	66	181,386	375	(14,711)	58	231,984	58	76,907
65	66	Helmerich & Payne, Inc.[9]	576,473	73	160,565	53	20,150	46	430,804	70	51,837
66	63	Unimar Co.	566,381	70	171,322	374	(14,089)	65	[34]192,997	82	30,625
67	97	Hadson Corp.	539,233	43	715,615	71	6,896	70	162,021	93	21,040
68	**68**	**Noble Affiliates, Inc.**	**526,694**	**64**	**191,721**	**58**	**11,832**	**64**	**199,012**	**56**	**83,665**
69	**71**	**Forest Oil Corp.**	**504,397**	**81**	**114,391**	**361**	**(5,137)**	**88**	**79,361**	**63**	**65,744**
70	**65**	**Tesoro Petroleum Corp.[9]**	**490,192**	**33**	**1,171,825**	**380**	**(19,355)**	**69**	**164,573**	**143**	**6,011**
71	**73**	**Adobe Resources Corp.**	**486,701**	**67**	**177,013**	**50**	**21,409**	**49**	**372,511**	**66**	**60,761**
72	**67**	**Pogo Producing Co.**	**479,251**	**74**	**158,755**	**367**	**(7,472)**	**154**	**19,552**	**81**	**30,651**
73	87	DEKALB Energy Co.[35]	404,610	89	69,464	62	10,512	61	213,766	65	62,924
74	123	NERCO Oil & Gas, Inc.[36]	404,000	85	88,900	65	[24]9,500	48	374,000	28	294,700
75	79	NRM Energy Company, L.P.	398,114	84	89,807	378	(17,387)	56	[12]247,075	71	50,637
76	90	Pelto Oil Co.	388,305	92	61,657	42	33,383	60	214,448	69	56,991
77	78	Santa Fe Energy Partners, L.P.[37]	378,300	79	126,700	384	(29,900)	62	[12]212,500	60	73,800
78	**81**	**Southern Union Co.**	**369,545**	**65**	**191,428**	**373**	**(10,064)**	**86**	**85,452**	**114**	**13,341**
79	**116**	**Presidio Oil Co.**	**347,241**	**117**	**27,187**	**360**	**(4,429)**	**135**	**26,713**	**124**	**11,212**
80	**83**	**Ram Industries, Inc.[38]**	**343,377**	**—**	**0**	**220**	**(93)**	**50**	**337,382**	**—**	**0**
81	**86**	**First Mississippi Corp.[38]**	**330,334**	**54**	**353,644**	**44**	**32,475**	**66**	**186,442**	**67**	**60,381**
82	**91**	**Southwestern Energy Co.**	**311,632**	**83**	**95,503**	**59**	**11,532**	**81**	**94,115**	**92**	**21,368**
83	88	Seagull Energy Corp.	308,384	71	163,629	86	3,338	77	108,409	91	21,713
84	84	National Cooperative Refinery Association[39]	304,885	45	603,976	371	(9,532)	71	[40]135,698	102	17,936
85	127	American Exploration Co.	296,881	103	39,309	114	1,147	136	26,325	31	266,198
86	82	Diamond Shamrock Offshore Partners L.P.[41]	272,231	76	142,664	43	32,553	57	[12]242,879	79	37,350
87	149	Pauley Petroleum, Inc.[9]	261,436	58	234,450	366	(6,959)	104	56,461	88	24,493
88	**93**	**The Quinoco Companies**	**240,365**	**87**	**74,652**	**77**	**4,080**	**68**	**170,787**	**89**	**23,740**
89	**100**	**Norcen Energy Resources Ltd. (US Operations)[42]**	**233,672**	**118**	**24,574**	**92**	**2,564**	**—**	**NA**	**74**	**44,872**
90	**95**	**TGX Corp.**	**232,019**	**80**	**121,261**	**311**	**(938)**	**79**	**98,628**	**150**	**4,848**
91	**207**	**AMAX Oil & Gas Inc.[43]**	**229,067**	**119**	**22,321**	**78**	**3,789**	**59**	**215,465**	**36**	**214,386**
92	**99**	**Northern Michigan Exploration Co.[44]**	**211,881**	**93**	**59,377**	**98**	**1,824**	**72**	**135,089**	**77**	**43,199**
93	103	Home Petroleum Corp.[45]	202,670	95	46,232	359	(4,427)	82	90,6[illegible]1	98	18,469
94	113	Harken Energy Corp.[46]	190,775	40	746,767	72	6,034	97	70,947	84	28,177
95	98	Allegheny & Western Energy Corp.[39]	179,435	68	174,140	76	4,449	84	87,346	99	18,418
96	104	Snyder Oil Partners L.P.[47]	176,381	94	58,481	376	(15,037)	76	[12]110,750	85	27,518
97	96	Damson Energy Co. L.P.	175,435	88	71,538	387	(33,796)	93	[12]74,714	177	2,386
98	**122**	**Noble Drilling Corp.**	**175,331**	**97**	**44,244**	**369**	**(8,427)**	**74**	**124,919**	**140**	**6,359**
99	**106**	**Global Natural Resources Inc.**	**154,214**	**101**	**40,294**	**320**	**(1,148)**	**85**	**85,543**	**109**	**14,178**
100	**117**	**Parker & Parsley Development Partners L.P.**	**153,976**	**105**	**38,436**	**368**	**(7,913)**	**75**	**[12]115,975**	**94**	**20,173**
101	**219**	**Bridge Oil (U.S.A.) Inc.[48]**	**142,050**	**174**	**9,842**	**271**	**(425)**	**90**	**77,767**	**51**	**113,823**
102	**112**	**Wainoco Oil Corp.**	**140,329**	**107**	**35,428**	**82**	**3,444**	**92**	**74,818**	**97**	**18,798**

Worldwide liquids production		Worldwide natural gas production		Worldwide liquids reserves		Worldwide natural gas reserves		U.S. liquids production		U.S. natural gas production		U.S. liquids reserves		U.S. natural gas reserves		U.S. net wells drilled	
Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Wells
41	4.191	47	41.83	48	24.96	49	355.7	36	4.191	44	41.83	42	24.96	46	355.7	54	30.80
72	1.182	59	23.78	81	7.574	67	208.0	67	1.142	57	23.07	74	7.327	62	198.0	87	12.00
38	4.673	39	52.97	52	18.40	45	459.3	33	4.673	38	52.97	46	18.40	40	459.3	69	21.70
59	1.937	44	47.62	32	58.52	27	975.1	133	0.292	99	6.028	124	2.800	122	38.83	112	5.050
119	0.430	69	16.70	132	2.569	81	127.9	111	0.430	63	16.70	126	2.569	72	127.9	79	15.68
174	0.149	62	21.41	152	1.811	85	118.6	185	0.109	59	20.33	203	0.805	86	89.83	—	0
89	0.800	117	4.563	94	5.918	104	69.62	86	0.800	114	4.563	86	5.918	98	69.62	38	50.25
56	2.252	38	52.99	55	16.52	46	425.3	51	2.252	37	52.99	50	16.52	42	425.3	53	31.46
137	0.280	162	1.853	157	1.623	119	46.26	136	0.280	160	1.853	152	1.623	115	46.26	167	1.720
79	0.994	73	14.51	86	6.837	77	147.6	77	0.937	75	11.90	95	5.257	83	92.59	95	9.340
61	1.792	207	0.833	76	9.262	232	6.107	56	1.792	204	0.833	68	9.262	224	6.107	77	16.00
94	0.705	91	8.189	87	6.826	101	76.07	90	0.705	85	8.189	80	6.826	95	76.07	133	4.040
36	4.734	60	23.78	36	40.67	74	154.5	81	0.887	87	7.748	115	3.402	129	35.28	119	4.690
85	0.899	70	16.60	89	6.299	58	279.6	80	0.899	64	16.60	82	6.299	52	279.6	83	14.58
60	1.795	30	80.54	63	13.49	29	899.3	85	0.832	83	8.613	107	4.154	109	52.36	132	4.080
103	0.645	97	6.895	92	5.925	128	36.26	125	0.335	94	6.895	167	1.391	124	36.26	159	2.020
44	3.733	36	56.69	41	30.87	52	337.1	42	3.341	34	55.79	35	27.18	50	317.3	48	36.11
105	0.638	49	41.26	74	9.713	54	331.9	108	0.515	48	39.72	77	7.081	54	269.4	82	14.90
69	1.315	142	2.646	385	0.004	374	0.208	119	0.377	141	2.646	385	0.004	373	0.208	226	0.330
49	2.961	58	24.21	39	32.88	62	233.8	55	1.824	56	24.21	36	26.43	57	233.8	90	11.80
47	3.059	51	39.61	50	18.77	59	268.7	44	3.059	49	39.61	44	18.77	55	268.7	99	8.400
52	2.842	63	20.16	44	26.69	50	342.2	54	1.830	91	7.155	65	10.34	103	63.42	60	24.00
78	1.071	57	26.74	79	8.634	57	309.7	72	1.071	55	26.74	71	8.634	51	309.7	—	NA
80	0.980	61	23.03	70	11.29	72	183.5	73	0.980	58	23.03	62	11.29	67	183.5	46	37.10
98	0.661	67	16.82	83	7.196	73	169.8	93	0.661	61	16.82	76	7.196	68	169.8	57	25.60
35	4.900	54	35.10	46	25.70	71	187.4	31	4.900	52	35.10	40	25.70	66	187.4	51	35.80
153	0.207	122	3.778	143	2.107	99	77.83	151	0.207	119	3.778	140	2.107	93	77.83	130	4.100
112	0.553	88	8.682	59	14.72	68	193.4	103	0.553	82	8.682	52	14.72	63	193.4	55	26.80
—	0	—	0	66	11.85	40	581.8	—	0	—	0	58	11.85	35	581.8	—	0
132	0.328	93	7.241	118	3.661	125	40.13	130	0.328	89	7.241	110	3.661	120	40.13	103	7.000
168	0.160	80	11.99	201	0.911	64	216.0	165	0.160	73	11.99	198	0.911	59	216.0	66	22.20
252	0.046	107	5.615	127	3.081	112	55.26	249	0.046	105	5.615	121	3.081	107	55.26	110	5.270
68	1.336	121	3.885	90	6.134	106	65.91	62	1.336	118	3.885	83	6.134	100	65.91	47	37.00
81	0.979	86	9.194	93	5.920	92	92.62	74	0.979	80	9.194	85	5.920	82	92.62	163	1.890
58	2.013	42	47.98	65	12.36	70	188.7	53	2.013	41	47.98	57	12.36	65	188.7	88	12.00
46	3.287	76	13.69	54	16.75	88	108.7	43	3.287	69	13.69	49	16.75	79	108.7	63	22.90
57	2.173	71	15.45	72	10.74	65	213.9	52	2.173	65	15.45	64	10.74	60	213.9	72	20.00
99	0.661	84	10.06	98	5.729	84	121.0	94	0.661	78	10.06	89	5.729	76	121.0	71	21.10
148	0.222	110	5.400	148	1.947	75	153.3	147	0.222	108	5.400	144	1.947	69	153.3	202	0.730
125	0.361	103	5.943	71	11.08	63	233.2	121	0.361	101	5.943	63	11.08	58	233.2	106	6.400
65	1.420	81	11.95	56	15.16	91	93.86	65	1.249	74	11.95	98	4.991	87	89.58	33	59.10
63	1.589	83	10.94	77	9.169	96	85.54	58	1.589	77	10.94	69	9.169	89	85.54	56	25.90
171	0.156	201	0.962	137	2.291	150	26.09	169	0.156	198	0.962	134	2.291	146	26.09	116	4.930
359	0.005	150	2.351	339	0.071	144	26.81	359	0.005	148	2.351	338	0.071	139	26.81	74	17.05
71	1.264	77	13.15	78	9.133	83	122.2	64	1.264	70	13.15	70	9.133	75	122.2	85	13.30
77	1.090	92	8.125	104	5.361	102	74.42	71	1.090	86	8.125	93	5.361	96	74.42	—	0
164	0.166	213	0.744	190	1.065	220	7.255	259	0.040	216	0.600	261	0.313	259	3.655	155	2.350
110	0.600	85	10.03	102	5.554	76	152.8	101	[6]0.577	88	[6]7.395	101	[6]4.862	85	[6]90.06	92	10.30
74	1.121	82	11.54	62	13.52	87	110.8	68	1.121	76	11.54	55	13.52	78	110.8	58	25.40
128	0.334	155	2.045	51	18.70	93	91.99	126	0.334	153	2.045	45	18.70	84	91.99	—	NA
100	0.660	65	18.79	100	5.632	60	248.7	122	0.361	129	3.116	117	3.268	106	55.54	109	5.310

Rank by total assets			Total assets	Total revenue		Net income		Stockholders' equity		Capital & expl. spending	
1988	1987	Company	$000	Rank	$000	Rank	$000	Rank	$000	Rank	$000
103	101	Conquest Exploration Co.	140,023	99	42,071	389	(46,805)	94	74,595	130	9,831
104	108	Howell Corp.	134,577	57	235,794	383	(28,634)	140	24,288	100	18,026
105	111	Avalon Corp.	132,985	116	28,224	266	(374)	78	107,162	90	23,687
106	119	Ensource Inc.	106,848	111	32,649	342	(2,596)	159	19,000	121	12,118
107	120	The Wiser Oil Co.	103,810	115	30,633	93	2,461	83	89,346	107	14,488
108	118	Sage Energy Co.[38]	100,307	112	32,474	352	(3,446)	103	56,731	83	28,664
109	124	San Juan Basin Royalty Trust	98,914	158	12,560	57	12,122	80	[49]98,627	—	0
110	115	Damson Oil Corp.[9]	94,796	126	20,562	382	(28,236)	386	(12,421)	218	1,014
111	—	Key Production Co. Inc.	90,770	110	34,824	330	(1,458)	116	40,501	184	2,051
112	—	Devon Energy Corp.	89,116	124	21,154	85	3,347	111	41,557	154	4,623
113	130	Integrated Drilling and Exploration Inc.[50]	87,843	123	21,186	362	(5,444)	89	78,161	169	2,858
114	131	Crystal Oil Co.	86,374	114	31,299	350	(3,322)	110	42,803	167	2,987
115	126	Prudential-Bache Energy Income LP VP-19	85,856	133	18,643	354	(3,580)	91	[12]77,515	135	8,401
116	142	Patrick Petroleum Co.	83,752	161	12,235	130	777	122	35,059	120	12,201
117	125	Prudential-Bache Energy Income L.P. IV P-17	82,015	122	21,229	102	1,635	95	[12]74,322	151	4,786
118	140	Exploration Co. of Louisiana, Inc.	81,427	178	8,791	96	2,212	102	60,130	118	12,995
119	—	Prudential-Bache Energy Income LP VP-21	81,100	182	8,021	145	390	96	[12]72,824	64	64,332
120	—	Buttes Gas & Oil Co.[51]	79,790	136	17,673	372	(9,615)	137	26,127	255	392
121	129	Prudential-Bache Energy Income L.P. IV P-16	78,218	127	20,318	113	1,150	99	[12]70,547	145	5,808
122	135	Plains Resources Inc.	78,031	146	15,310	325	(1,225)	142	23,877	103	16,061
123	136	Tom Brown Inc.[38]	76,318	132	18,662	124	853	128	29,011	152	4,754
124	139	Berry Petroleum Co.	72,912	100	41,669	66	9,152	105	55,705	155	4,422
125	—	Prudential-Bache Energy Income LP VP-22	67,344	273	1,649	191	33	100	[12]61,101	76	44,236
126	137	Prudential-Bache Energy Income LP VP-18	66,972	147	14,790	335	(1,711)	101	[12]60,590	180	2,294
127	—	Production Operators Corp.[9]	65,941	96	44,770	90	2,680	132	28,469	136	8,362
128	152	Unit Corp.	64,984	113	31,555	333	(1,617)	117	38,643	111	13,956
129	164	Fuel Resources Inc.[9,52]	62,206	143	15,583	91	2,662	155	19,437	125	10,774
130	—	Prudential-Bache Energy Income LP VP-20	57,835	188	7,315	149	356	106	[12]51,948	72	48,312
131	154	Calumet Industries Inc.[9]	56,901	104	39,281	340	(2,477)	158	19,027	148	5,427
132	151	Equity Oil Co.	55,970	157	12,678	142	435	114	40,948	146	5,589
133	176	Samson Energy Co. L.P.[53]	55,783	150	14,274	267	(388)	124	[12]33,156	132	8,602
134	158	Thermal Exploration Co.[9]	55,446	172	10,056	81	3,599	—	NA	105	14,726
135	185	Plains Petroleum Co.	52,733	109	35,190	64	9,825	123	34,244	149	5,272
136	150	Prudential-Bache Energy Income L.P. III P-14	52,389	169	10,654	139	514	108	[12]47,881	179	2,310
137	—	MGF Oil Corp.[54]	52,231	130	19,697	326	(1,285)	161	17,465	189	1,852
138	169	Ethyl Corp.(Oil & Gas Division)	[55]51,347	142	15,657	94	[5]2,419	109	47,673	127	10,588
139	166	Wolverine Exploration Co.	51,170	180	8,136	390	(48,368)	384	(9,511)	47	133,005
140	—	Prudential-Bache Energy Growth Fund, L.P. G-1	48,685	250	2,334	349	(2,994)	107	[12]48,309	235	717
141	174	Fuel Resources Development Co.(FUELCO)[56]	48,339	102	39,885	131	712	145	22,401	161	3,734
142	170	Kelley Oil & Gas Partners, Ltd.[57]	47,969	144	15,488	97	1,974	120	35,549	139	6,820
143	215	American National Petroleum Co.	47,657	159	12,533	155	271	175	13,659	194	1,681
144	161	Wilshire Oil Co. of Texas	46,126	191	7,166	309	(924)	180	12,721	164	3,418
145	147	Apache Offshore Investment Partnership[58]	46,034	185	7,618	381	(19,367)	379	(3,748)	104	15,521
146	141	Beard Oil Co.[59]	45,464	137	17,560	323	(1,199)	121	35,234	110	14,095
147	156	Bogert Oil Co.[9]	45,394	129	19,713	115	1,145	149	21,089	133	8,511
148	157	Prudential-Bache Energy Income L.P. III P-12	45,321	170	10,633	89	2,748	115	[12]40,620	205	1,402
149	155	Prudential-Bache Energy Income L.P. III P-15	45,146	176	9,163	144	393	113	[12]41,282	192	1,798
150	180	Penn Virginia Resources Corp.[60]	43,997	196	6,796	234	[61](139)	—	NA	129	10,025
151	163	Clinton Gas Systems, Inc.	43,836	98	43,125	181	83	156	19,429	174	[62]2,561
152	148	Freeport-McMoRan Oil and Gas Royalty Trust	43,523	168	10,811	63	[63]10,098	112	[49]41,311	—	NA
153	165	Alamco, Inc.	40,886	163	11,277	160	236	195	10,185	265	313

Worldwide liquids production		Worldwide natural gas production		Worldwide liquids reserves		Worldwide natural gas reserves		U.S. liquids production		U.S. natural gas production		U.S. liquids reserves		U.S. natural gas reserves		U.S. net wells drilled	
Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Wells
82	0.947	79	12.05	105	5.360	103	74.36	75	0.947	72	12.05	94	5.360	97	74.36	96	8.900
87	0.841	99	6.622	96	5.893	95	87.57	84	0.833	98	6.251	88	5.764	92	78.37	123	4.430
92	0.759	89	8.397	97	5.878	79	132.3	116	0.399	240	0.421	128	2.526	270	3.127	108	5.600
120	0.417	87	8.719	119	3.597	86	114.0	112	0.417	81	8.719	111	3.597	77	114.0	111	5.260
83	0.944	108	5.513	64	12.72	97	81.71	76	0.944	106	5.513	56	12.72	90	81.71	39	49.90
66	1.365	112	5.062	67	11.80	137	31.32	60	1.365	110	5.062	59	11.80	133	31.32	70	21.18
263	0.040	96	6.927	195	1.047	61	242.5	260	0.040	93	6.927	191	1.047	56	242.5	174	1.300
121	0.404	138	2.723	163	1.539	165	20.98	115	0.404	137	2.723	158	1.539	160	20.98	157	2.220
102	0.650	74	14.48	128	2.892	107	64.51	95	0.650	67	14.48	122	2.892	101	64.51	193	0.870
111	0.568	104	5.919	101	5.590	90	98.39	102	0.568	102	5.919	91	5.590	81	98.39	139	3.800
204	0.085	144	2.564	166	1.509	120	44.63	201	0.085	143	2.564	161	1.509	116	44.63	148	3.000
75	1.118	90	8.325	108	4.983	115	47.27	69	1.118	84	8.325	99	4.983	111	47.27	131	4.100
91	0.773	124	3.547	106	5.176	162	22.56	88	0.773	122	3.547	96	5.176	157	22.56	–	NA
159	0.187	151	2.181	179	1.187	151	25.99	157	0.187	149	2.181	176	1.187	147	25.99	129	4.140
109	0.606	105	5.774	115	4.336	127	38.16	100	0.606	103	5.774	106	4.336	123	38.16	–	NA
256	0.045	159	1.936	270	0.293	142	28.37	253	0.045	157	1.936	267	0.293	137	28.37	145	3.267
142	0.246	172	1.499	82	7.235	113	53.26	141	0.246	170	1.499	75	7.235	108	53.26	–	NA
149	0.217	141	2.666	196	1.030	109	62.28	148	0.217	140	2.666	193	1.030	104	62.28	252	0.100
106	0.621	111	5.367	113	4.608	129	36.03	97	0.621	109	5.367	104	4.608	125	36.03	–	NA
157	0.197	115	4.834	156	1.630	105	66.37	155	0.197	112	4.834	151	1.630	99	66.37	84	13.88
97	0.675	140	2.708	110	4.753	111	57.19	92	0.675	139	2.708	102	4.753	105	57.19	151	2.900
50	2.950	238	0.468	34	52.58	218	7.853	45	2.950	234	0.468	28	52.58	213	7.853	205	0.650
–	0	356	0.039	146	2.004	122	43.38	–	0	356	0.039	141	2.004	118	43.38	–	NA
114	0.527	123	3.618	117	3.821	169	18.54	106	0.527	120	3.618	109	3.821	164	18.54	–	NA
118	0.459	193	1.122	141	2.167	257	4.146	110	0.459	190	1.122	138	2.167	252	4.146	–	0
139	0.257	130	3.122	160	1.610	157	24.95	138	0.257	128	3.122	155	1.610	152	24.95	65	22.56
185	0.116	137	2.724	257	0.365	126	38.97	181	0.116	136	2.724	253	0.365	121	38.97	–	NA
144	0.233	187	1.200	99	5.694	131	35.64	143	0.233	184	1.200	90	5.694	127	35.64	–	NA
243	0.054	–	0	280	0.245	–	0	239	0.054	–	0	276	0.245	–	0	–	0
96	0.679	202	0.914	75	9.574	141	30.39	104	0.540	214	0.649	73	7.837	145	26.18	126	4.300
158	0.189	95	6.978	193	1.058	118	46.50	156	0.189	92	6.978	189	1.058	114	46.50	91	10.80
140	0.254	126	3.312	173	1.279	159	23.14	139	0.254	124	3.312	170	1.279	154	23.14	67	21.80
145	0.233	64	20.04	123	3.311	48	371.5	144	0.233	60	20.04	116	3.311	45	371.5	49	36.00
129	0.332	133	2.938	136	2.324	132	35.52	127	0.332	132	2.938	133	2.324	128	35.52	–	NA
122	0.384	120	4.188	142	2.166	147	26.65	117	0.384	117	4.188	139	2.166	142	26.65	125	4.310
117	0.465	114	4.938	131	2.740	124	40.27	113	0.409	121	3.601	130	2.442	185	13.97	104	6.990
179	0.129	214	0.720	202	0.892	155	25.25	176	[6]0.129	209	[6]0.720	199	[6]0.892	150	[6]25.25	28	67.00
338	0.009	275	0.269	289	0.221	252	4.382	337	0.009	274	0.269	285	0.221	246	4.382	–	NA
146	0.233	129	3.195	204	0.823	94	89.18	145	0.233	127	3.195	201	0.823	88	89.18	128	4.170
205	0.084	98	6.778	222	0.539	98	80.42	202	0.084	95	6.778	219	0.539	91	80.42	115	4.940
161	0.182	146	2.489	169	1.474	130	35.84	159	0.182	145	2.489	164	1.474	126	35.84	197	0.810
150	0.214	149	2.353	145	2.009	134	33.01	163	0.163	175	1.406	187	1.070	186	13.71	177	1.200
310	0.016	119	4.240	295	0.208	148	26.42	307	0.016	116	4.240	291	0.208	143	26.42	172	1.380
93	0.728	143	2.624	120	3.595	183	14.83	89	0.728	142	2.624	112	3.595	178	14.83	61	23.29
131	0.329	101	6.558	135	2.331	114	50.54	129	0.329	97	6.558	132	2.331	110	50.54	80	15.50
170	0.159	132	3.000	178	1.196	108	63.61	168	0.159	131	3.000	175	1.196	102	63.61	–	NA
136	0.282	145	2.533	147	1.969	140	30.48	135	0.282	144	2.533	142	1.969	136	30.48	–	NA
293	0.023	157	2.000	277	0.269	117	46.50	290	0.023	155	2.000	273	0.269	113	46.50	–	NA
206	0.084	158	1.943	273	0.284	188	14.23	203	0.084	156	1.943	269	0.284	183	14.23	86	12.69
186	0.115	118	4.386	261	0.356	143	27.04	182	0.115	115	4.386	257	0.356	138	27.04	–	NA
273	0.034	147	2.404	262	0.327	149	26.22	270	0.034	146	2.404	258	0.327	144	26.22	–	0

Rank by total assets 1988	Rank by total assets 1987	Company	Total assets $000	Total revenue Rank	Total revenue $000	Net income Rank	Net income $000	Stockholders' equity Rank	Stockholders' equity $000	Capital & expl. spending Rank	Capital & expl. spending $000
154	168	OKC L.P.	39,696	106	36,396	83	3,440	139	[12]24,341	131	9,561
155	153	Houston Oil Trust	38,367	204	5,601	79	[63]3,716	118	[49]38,367	—	NA
156	171	General Energy Development Ltd.	37,489	135	17,727	103	1,633	134	26,981	144	5,901
157	189	Coho Resources Inc.[64]	37,448	190	[55]7,253	80	3,640	—	NA	106	14,699
158	159	Texas International Co.[65]	37,214	108	35,322	377	(15,272)	390	(157,736)	95	19,457
159	162	Paine Webber/Geodyne Energy Income L.P. II-A	37,094	167	11,130	112	1,168	119	[12]36,764	101	17,969
160	167	Pend Oreille Oil & Gas Co.[66]	36,917	140	16,526	336	(1,756)	144	23,765	128	10,380
161	182	McFarland Energy Inc.	36,807	154	13,142	364	(5,699)	133	27,671	137	7,946
162	175	Maynard Oil Co.	36,651	139	16,527	109	1,345	129	28,845	147	5,486
163	172	Oregon Natural Gas[67]	34,167	141	16,405	125	847	220	6,263	158	3,964
164	177	Prudential-Bache Energy Income L.P. III P-13	33,704	195	6,819	147	382	125	[12]30,783	198	1,549
165	181	Chapman Energy Inc.[39]	32,944	165	11,199	316	(1,110)	334	630	237	598
166	188	Saxon Oil Co.	32,765	164	11,254	106	1,425	160	18,510	254	396
167	190	Fidelity Oil Group[68]	32,030	166	11,177	74	5,115	143	23,865	108	14,278
168	178	Callon Consolidated Partners L.P.[69]	31,965	153	13,413	119	1,004	141	[12]24,201	249	422
169	183	Enex Resources Corp.[70]	31,579	179	8,632	313	(1,018)	127	29,525	203	1,407
170	310	Comstock Resources, Inc.	31,568	212	4,920	165	174	187	10,726	122	12,076
171	209	Swift Energy Co.	31,463	156	12,685	75	4,678	169	15,769	188	1,920
172	—	Mission Resource Partners, L.P.[71]	31,239	152	13,545	87	2,905	162	[12]17,103	119	12,247
173	192	Texas Meridian Resources Ltd.[72]	30,122	181	8,122	348	(2,969)	184	[12]11,964	267	304
174	—	Paine Webber/Geodyne Energy Income L.P. I-E	30,081	151	13,737	73	5,299	126	[12]29,679	309	146
175	—	Paine Webber/Geodyne Energy Income L.P. II-D	29,210	226	3,547	117	1,072	131	[12]28,508	87	26,808
176	205	ICG Petroleum Inc.[73]	28,915	222	3,764	284	(546)	146	22,400	314	136
177	187	Paine Webber/Geodyne Energy Income L.P. II-B	28,728	197	6,576	310	(937)	130	[12]28,728	86	27,448
178	191	Alexander Energy Corp.	28,688	238	2,870	289	(603)	191	10,445	208	1,349
179	186	Tipperary Corp.[9]	28,623	134	17,801	68	7,441	380	(4,161)	209	1,337
180	210	Taurus Exploration, Inc.[9,74]	28,536	155	13,034	84	3,350	177	12,999	126	10,641
181	—	KCS Group Inc.[9]	27,991	90	68,562	341	(2,552)	189	10,550	170	2,719
182	196	MSR Exploration Ltd.[75]	27,774	232	3,254	254	(308)	147	21,646	195	1,658
183	173	BI Industries, Inc.[76]	27,639	173	10,002	127	826	166	16,385	323	109
184	200	Petroleum Development Corp.	27,591	175	9,294	315	(1,094)	188	10,711	225	863
185	194	Saxon Oil Development Partners L.P.[77]	27,012	171	10,495	337	(1,782)	157	[12]19,392	259	358
186	202	ConVest Energy Partners Ltd.[78]	25,136	183	7,854	261	(356)	152	[12]20,123	175	2,558
187	193	Deminex U.S. Oil Co.[79]	25,045	149	14,550	270	(422)	217	6,786	168	2,946
188	198	Prudential-Bache Energy Income L.P. II P-8	24,038	202	6,035	169	165	148	[12]21,332	284	239
189	208	Mustang Resources Corp.[80]	23,612	199	6,451	358	(4,309)	240	4,774	221	924
190	204	Bellwether & Blake Energy Co.	22,975	177	9,085	343	(2,608)	173	[12]14,118	219	970
191	206	Prudential-Bache Energy Income L.P. II P-10	22,960	208	5,342	111	1,235	151	[12]20,502	285	226
192	220	Geodyne Resources, Inc.[81]	22,949	128	20,190	69	7,389	179	12,914	242	566
193	211	KenCope Energy Companies[39]	22,927	160	12,488	345	(2,634)	196	9,929	182	2,146
194	195	Federated Natural Resources Corp.[82]	22,468	187	7,385	351	(3,323)	345	534	181	2,244
195	212	Barrett Resources Corp.[9]	21,696	203	5,747	110	1,340	163	16,552	157	4,243
196	199	Consolidated Energy Partners L.P.[83,84]	21,445	200	6,143	297	(734)	388	[12](20,243)	305	157
197	—	Columbus Energy Corp.[83]	21,348	186	7,498	285	(551)	203	8,891	190	1,840
198	—	Paine Webber/Geodyne Energy Income L.P. II-E	20,923	307	963	156	262	150	[12]20,550	116	13,171
199	203	LL & E Royalty Trust	20,047	138	17,110	55	[63]16,079	153	[49]20,047	—	NA
200	214	Bersch-Foster Corp.	19,677	184	7,655	344	(2,629)	197	9,762	163	3,431
201	217	Hershey Oil Corp.	18,968	215	4,545	346	(2,680)	181	12,363	153	4,647
202	216	Prudential-Bache Energy Income L.P. II P-11	18,337	218	4,188	118	1,019	165	[12]16,389	290	207
203	228	Belcor Inc.[86]	18,240	120	21,793	123	860	224	5,953	308	151
204	218	Tucker Drilling Co. Inc.[39]	18,224	145	15,364	295	(692)	164	16,393	178	2,328

Worldwide liquids production		Worldwide natural gas production		Worldwide liquids reserves		Worldwide natural gas reserves		U.S. liquids production		U.S. natural gas production		U.S. liquids reserves		U.S. natural gas reserves		U.S. net wells drilled	
Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Wells
84	0.911	106	5.762	126	3.128	116	47.07	78	0.911	104	5.762	120	3.128	112	47.07	206	0.630
133	0.302	128	3.236	189	1.090	174	16.88	131	0.302	126	3.236	186	1.090	169	16.88	192	0.900
123	0.382	100	6.584	150	1.919	133	34.86	118	0.382	96	6.584	146	1.919	130	34.86	162	1.900
86	0.885	340	0.061	38	35.00	190	13.27	82	0.885	339	0.061	32	35.00	187	13.27	76	16.20
62	1.719	247	0.383	80	8.426	202	10.84	244	0.049	244	0.383	322	0.114	374	0.194	194	0.860
134	0.294	127	3.293	162	1.548	156	25.03	132	0.294	125	3.293	157	1.548	151	25.03	—	NA
130	0.331	109	5.443	171	1.383	163	21.82	128	0.331	107	5.443	168	1.383	158	21.82	105	6.650
88	0.835	166	1.706	95	5.914	207	9.99	83	0.835	164	1.706	87	5.914	202	9.993	117	4.800
141	0.254	148	2.376	155	1.660	160	23.10	140	0.254	147	2.376	150	1.660	155	23.10	124	4.401
299	0.019	218	0.702	325	0.105	261	3.871	296	0.019	213	0.702	324	0.105	256	3.871	186	1.000
151	0.213	161	1.866	168	1.478	161	22.80	149	0.213	159	1.86[illegible]	163	1.478	156	22.80	—	NA
173	0.154	152	2.136	211	0.676	192	12.73	171	0.154	150	2.136	207	0.676	189	12.73	253	0.100
113	0.540	168	1.641	112	4.629	177	16.60	105	0.540	166	1.641	103	4.629	172	16.60	248	0.170
67	1.358	176	1.464	69	11.50	210	9.400	61	1.344	173	1.444	61	11.40	208	8.600	50	36.00
107	0.620	153	2.070	122	3.530	198	11.23	98	0.620	151	2.070	114	3.530	195	11.23	231	0.280
156	0.199	156	2.032	194	1.056	181	15.29	154	0.199	154	2.032	190	1.056	176	15.29	196	0.812
147	0.229	246	0.388	116	3.961	136	31.64	146	0.229	243	0.388	108	3.961	132	31.64	243	0.200
209	0.080	200	0.963	203	0.840	197	11.29	206	0.080	197	0.963	200	0.840	194	11.29	89	12.00
126	0.347	160	1.924	53	16.78	179	16.01	123	0.347	158	1.924	48	16.78	174	16.01	64	22.80
183	0.124	131	3.069	167	1.501	146	26.67	180	0.124	130	3.069	162	1.501	141	26.67	244	0.200
155	0.200	116	4.723	184	1.109	135	32.24	153	0.200	113	4.723	181	1.109	131	32.24	—	NA
217	0.074	179	1.378	192	1.060	145	26.70	214	0.074	177	1.378	188	1.060	140	26.70	—	NA
202	0.089	285	0.221	219	0.548	298	1.826	199	0.089	284	0.221	216	0.548	295	1.826	224	0.430
154	0.202	154	2.052	180	1.142	171	18.37	152	0.202	152	2.052	177	1.142	166	18.37	—	NA
218	0.074	188	1.178	149	1.928	172	17.42	215	0.074	185	1.178	145	1.928	167	17.42	146	3.246
135	0.286	177	1.408	121	3.534	152	25.97	134	0.286	174	1.408	113	3.534	148	25.97	176	1.230
198	0.094	113	4.976	271	0.292	184	[78]14.80	195	0.094	111	4.976	268	0.292	179	[78]14.80	31	64.00
225	0.070	184	1.256	283	0.242	228	6.295	221	0.070	181	1.256	279	0.242	220	6.295	169	1.500
177	0.135	359	0.038	125	3.177	235	5.407	174	[6]0.135	359	[6]0.038	119	3.149	251	4.167	113	5.000
298	0.020	221	0.588	306	0.159	250	4.469	295	0.020	217	0.588	302	0.159	244	4.469	259	0.030
300	0.019	215	0.720	296	0.196	166	20.20	297	0.019	210	0.720	292	0.196	161	20.20	152	2.810
116	0.514	171	1.602	114	4.434	178	16.12	109	0.514	169	1.602	105	4.434	173	16.12	251	0.140
138	0.267	186	1.205	139	2.252	185	14.52	137	0.267	183	1.205	136	2.252	180	14.52	127	4.200
104	0.644	139	2.709	107	5.077	167	19.91	96	0.644	138	2.709	97	5.077	162	19.91	120	4.600
187	0.115	163	1.768	236	0.463	164	21.26	183	0.115	161	1.768	232	0.463	159	21.26	—	NA
210	0.080	191	1.143	186	1.095	138	31.00	207	0.080	188	1.143	183	1.095	134	31.00	233	0.260
124	0.363	167	1.665	130	2.746	176	16.67	120	0.363	165	1.665	125	2.746	171	16.67	—	0
207	0.082	174	1.480	212	0.669	139	30.95	204	0.082	172	1.480	208	0.669	135	30.95	—	NA
221	0.072	173	1.489	209	0.722	182	14.83	217	0.072	171	1.489	205	0.722	177	14.83	—	0
242	0.056	223	0.580	254	0.371	234	5.423	238	0.056	219	0.580	250	0.371	228	5.423	141	3.685
178	0.134	165	1.714	247	0.408	194	12.31	175	0.134	163	1.714	243	0.408	191	12.31	209	0.610
248	0.049	178	1.393	274	0.278	158	24.07	245	0.049	176	1.393	270	0.278	153	24.07	143	3.550
211	0.080	134	2.927	172	1.319	100	76.57	208	0.080	133	2.927	169	1.319	94	76.57	—	0
162	0.181	208	0.832	144	2.029	154	25.40	166	0.160	253	0.353	166	1.426	226	5.492	250	0.160
289	0.025	268	0.296	225	0.524	193	12.61	286	0.025	266	0.296	222	0.524	190	12.61	—	NA
95	0.700	135	2.868	129	2.811	201	10.85	91	0.700	134	2.868	123	2.811	197	10.85	180	1.100
127	0.344	170	1.625	124	3.180	186	14.44	124	0.344	168	1.625	118	3.180	181	14.44	178	1.170
193	0.100	175	1.473	207	0.769	110	61.82	192	0.096	267	0.296	206	0.702	319	1.290	183	1.060
231	0.065	189	1.161	226	0.518	153	25.76	227	0.065	186	1.161	223	0.518	149	25.76	—	NA
232	0.063	317	0.102	275	0.277	363	0.388	228	0.063	316	0.102	271	0.277	362	0.388	—	0
283	0.029	256	0.352	320	0.119	308	1.531	280	0.029	254	0.352	317	0.119	305	1.531	153	2.700

Rank by total assets 1988	Rank by total assets 1987	Company	Total assets $000	Total revenue Rank	Total revenue $000	Net income Rank	Net income $000	Stockholders' equity Rank	Stockholders' equity $000	Capital & expl. spending Rank	Capital & expl. spending $000
205	223	Resource Exploration Inc.[9]	18,008	214	4,599	137	594	170	15,574	223	897
206	225	Garnet Resources Corp.	16,999	283	1,374	276	(487)	168	16,144	162	3,715
207	—	Prudential-Bache Pension&Int'l InvestorLP PI-1	16,874	299	1,070	186	51	167	[12]16,384	115	13,203
208	—	Pan Petroleum MLP	16,791	255	2,174	279	(509)	172	[12]14,382	289	210
209	232	Red Eagle Resources Corp.[9]	16,121	148	14,574	136	631	198	9,347	159	3,842
210	—	Sunlite Inc.[28]	16,102	207	5,388	99	1,785	171	15,326	312	142
211	213	Petroleum Investments, Ltd.	16,032	189	7,275	347	(2,767)	248	[12]4,049	201	1,494
212	—	Caspen Oil Inc.[66,67]	15,106	254	2,196	370	(9,273)	208	7,630	185	1,987
213	289	Kelley Oil Corp.	15,082	131	19,270	260	(355)	293	1,992	173	2,563
214	—	NY Life Oil&Gas Producing Properties II-D,L.P.	15,073	256	2,157	269	(420)	174	[12]13,956	113	13,463
215	248	Brock Exploration Corp.[38]	14,828	193	6,905	134	667	264	3,290	186	1,981
216	222	Prudential-Bache Energy Income L.P. II P-9	14,750	223	3,664	182	81	176	[12]13,112	311	145
217	230	Adams Resources & Energy Inc.	14,289	91	68,388	95	2,313	377	(1,731)	193	1,798
218	201	Nucorp, Inc.	13,829	194	6,893	166	172	182	12,235	165	3,143
219	238	Kimbark Oil & Gas Co.	13,828	221	3,850	339	(1,955)	268	3,097	257	365
220	—	Paine Webber/Geodyne Energy Income L.P. II-C	13,024	251	2,272	212	(41)	178	[12]12,951	112	13,575
221	253	Thor Energy Resources Inc.[14]	12,679	258	2,042	101	1,664	207	7,742	197	1,593
222	245	Dorchester Hugoton, Ltd.	12,504	210	5,204	88	2,831	193	10,258	183	2,092
223	226	Sabine Royalty Trust	12,450	125	20,745	54	19,336	183	[49]12,082	—	0
224	233	Energy Assets International Corp.	12,387	201	6,143	143	426	228	5,843	214	1,144
225	—	Gulf Exploration Consultants Inc.	12,266	162	11,835	357	(4,087)	235	5,082	134	8,510
226	243	Vermilion Bay Land Co.[38]	11,786	216	4,456	108	1,402	192	10,426	204	1,406
227	—	Prudential-Bache Pension&Int'l InvestorLP PI-2	11,610	380	183	206	(19)	185	[12]11,110	142	6,104
228	221	Columbian Energy Co. L.P.[9]	11,487	287	1,341	365	(6,226)	186	[12]10,788	317	128
229	240	The Home-Stake Royalty Corp.	11,452	209	5,341	116	1,096	194	10,252	176	2,477
230	227	Daleco Resources Corp.[8,70]	11,430	313	868	338	(1,803)	244	4,180	276	267
231	323	Arch Petroleum Inc.[85]	11,383	237	2,920	152	330	270	3,089	215	1,130
232	264	Castle Energy Corp.[9]	11,327	198	6,501	104	1,562	214	7,020	160	3,748
233	273	Nahama & Weagant Energy Co.[14]	11,150	231	3,302	126	831	200	9,126	211	1,279
234	259	Cobb Resources Corp.[29]	11,086	247	2,380	159	237	201	9,114	213	1,158
235	235	Prudential-Bache Energy Income L.P. II P-7	10,782	230	3,333	133	687	202	[12]8,938	310	146
236	237	Prudential-Bache Energy Income L.P. II P-4	10,648	240	2,847	177	101	206	[12]8,549	339	77
237	—	Paine Webber/Geodyne Energy Income L.P. I-F	10,620	211	5,152	100	1,709	190	[12]10,447	356	48
238	258	Bellwether Exploration Co.[39,80]	10,523	242	2,799	161	226	199	9,231	217	1,051
239	239	Premier Resources Ltd.[9]	10,188	227	3,531	107	1,405	308	1,609	272	285
240	241	Prudential-Bache Energy Income L.P. II P-5	10,172	259	2,024	225	(101)	205	[12]8,608	358	36
241	317	Ranger Oil Ltd.[42]	9,673	304	1,020	122	[89]874	—	NA	—	NA
242	254	Falcon Oil & Gas Co., Inc.[14]	9,521	264	1,888	150	350	218	6,505	250	407
243	246	Evergreen Resources Inc.[38,80]	9,140	358	422	287	(587)	210	7,157	238	594
244	278	Striker Petroleum Corp.	9,080	267	1,845	328	(1,381)	227	5,846	171	2,714
245	244	Prudential-Bache Energy Income L.P. II P-6	8,832	235	3,079	163	194	213	[12]7,066	355	50
246	247	Petrominerals Corp.	8,702	192	6,912	321	(1,156)	223	6,002	273	285
247	—	Prudential-Bache Pension & Retirement LP PBR-3	8,641	298	1,075	190	37	204	[12]8,628	295	187
248	260	Z G Energy Corp.	8,397	219	4,113	332	(1,528)	344	553	231	778
249	255	Permian Basin Royalty Trust	8,348	121	21,642	51	21,196	216	[49]6,827	—	NA
250	—	Prudential-Bache Energy Income Fund 1983P-3	8,302	224	3,568	141	446	251	[12]3,942	342	75
251	275	Credo Petroleum Corp.[65]	8,300	293	1,196	157	261	212	7,088	280	261
252	272	The Home-Stake Oil & Gas Co.	8,206	213	4,651	129	788	211	7,121	187	1,928
253	280	Whiting Petroleum Corp.	8,160	241	2,839	128	793	219	6,449	199	1,542
254	249	Sage Drilling Co., Inc.[29]	7,913	205	5,546	331	(1,477)	242	4,527	248	431
255	256	Trinity Resources Ltd.[91]	7,809	217	4,329	263	(365)	267	3,129	240	586

Worldwide liquids production		Worldwide natural gas production		Worldwide liquids reserves		Worldwide natural gas reserves		U.S. liquids production		U.S. natural gas production		U.S. liquids reserves		U.S. natural gas reserves		U.S. net wells drilled	
Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Wells
258	0.043	183	1.268	298	0.195	209	9.66	255	0.043	180	1.268	294	0.195	204	9.662	121	4.500
219	0.073	345	0.051	228	0.505	378	0.133	322	0.013	344	0.051	354	0.036	378	0.133	—	0
253	0.046	265	0.313	165	1.520	199	10.93	250	0.046	263	0.313	160	1.520	196	10.93	—	NA
196	0.095	222	0.587	176	1.229	170	18.49	193	0.095	218	0.587	173	1.229	165	18.49	239	0.230
241	0.057	205	0.867	233	0.481	216	8.127	237	0.057	202	0.867	229	0.481	211	8.127	97	8.600
259	0.043	219	0.662	272	0.291	212	8.913	300	0.018	320	0.089	308	0.139	351	0.503	—	0
188	0.113	136	2.727	223	0.539	180	15.91	184	0.113	135	2.727	220	0.539	175	15.91	—	NA
230	0.066	212	0.746	217	0.604	195	11.90	226	0.066	208	0.746	214	0.604	192	11.90	249	0.170
314	0.015	198	1.001	335	0.083	204	10.45	311	0.015	195	1.001	334	0.083	199	10.45	138	3.890
194	0.100	234	0.506	241	0.444	206	10.16	190	0.100	230	0.506	237	0.444	201	10.16	—	NA
190	0.106	185	1.207	220	0.540	187	14.41	187	0.106	182	1.207	217	0.540	182	14.41	213	0.530
226	0.070	196	1.068	268	0.302	175	16.86	222	0.070	193	1.068	265	0.302	170	16.86	—	NA
237	0.059	217	0.705	302	0.173	287	2.192	233	0.059	212	0.705	298	0.173	284	2.192	245	0.200
143	0.244	197	1.041	154	1.684	236	5.332	142	0.244	194	1.041	149	1.684	229	5.332	134	4.000
197	0.095	180	1.353	229	0.504	203	10.83	194	0.095	178	1.353	225	0.504	198	10.83	184	1.060
262	0.041	204	0.868	245	0.423	205	10.34	258	0.041	201	0.868	241	0.423	200	10.34	—	NA
269	0.037	240	0.446	213	0.658	196	11.74	266	0.037	236	0.446	209	0.658	193	11.74	215	0.500
—	0	94	7.224	—	0	78	137.5	—	0	90	7.224	—	0	70	137.5	—	0
90	0.786	102	6.017	88	6.362	121	44.49	87	0.786	100	6.017	81	6.362	117	44.49	—	0
284	0.028	194	1.081	281	0.243	191	13.17	281	0.028	191	1.081	277	0.243	188	13.17	187	1.000
387	(s)	315	0.105	276	0.274	266	3.574	387	(s)	314	0.105	272	0.274	262	3.574	181	1.100
180	0.128	227	0.550	200	0.916	243	4.678	177	0.128	223	0.550	197	0.916	237	4.678	170	1.400
—	0	—	0	242	0.443	237	5.323	—	0	—	0	238	0.443	230	5.323	—	NA
249	0.048	248	0.380	175	1.235	208	9.94	246	0.048	245	0.380	172	1.235	203	9.935	241	0.210
163	0.179	190	1.153	177	1.209	211	9.376	160	0.179	187	1.153	174	1.209	205	9.376	165	1.780
307	0.017	235	0.499	301	0.181	214	8.719	305	0.017	231	0.499	297	0.181	207	8.719	216	0.500
203	0.087	260	0.344	133	2.549	219	7.325	200	0.087	258	0.344	127	2.549	214	7.325	98	8.500
220	0.073	206	0.854	265	0.312	173	17.08	216	0.073	203	0.854	262	0.312	168	17.08	149	3.000
270	0.037	251	0.374	232	0.492	291	2.092	267	0.037	248	0.374	228	0.492	288	2.092	156	2.340
222	0.071	297	0.167	159	1.611	276	2.881	218	0.071	296	0.167	154	1.611	273	2.881	195	0.850
195	0.100	216	0.708	199	0.953	189	14.07	191	0.100	211	0.708	196	0.953	184	14.07	—	NA
167	0.163	250	0.375	161	1.590	244	4.667	164	0.163	247	0.375	156	1.590	238	4.667	—	NA
191	0.106	182	1.273	221	0.540	217	8.066	188	0.106	179	1.273	218	0.540	212	8.066	—	NA
234	0.061	211	0.771	251	0.392	256	4.204	230	0.061	207	0.771	247	0.392	250	4.204	158	2.040
184	0.122	181	1.341	206	0.811	200	10.88	343	0.008	199	0.947	323	0.113	210	8.399	229	0.330
192	0.105	257	0.352	187	1.095	246	4.627	189	0.105	255	0.352	184	1.095	240	4.627	—	NA
250	0.048	263	0.321	321	0.119	341	0.725	247	0.048	261	0.321	318	0.119	339	0.725	—	0
244	0.053	228	0.544	239	0.458	168	19.38	240	0.053	224	0.544	235	0.458	163	19.38	—	0
301	0.019	341	0.058	158	1.620	316	1.407	298	0.019	340	0.058	153	1.620	313	1.407	207	0.625
216	0.075	237	0.475	140	2.211	253	4.289	213	0.075	233	0.475	137	2.211	247	4.289	232	0.270
176	0.139	225	0.556	174	1.249	273	3.284	173	0.139	221	0.556	171	1.249	269	3.284	—	NA
172	0.156	311	0.132	170	1.464	351	0.524	170	0.156	310	0.132	165	1.464	349	0.524	—	0
239	0.058	230	0.525	255	0.371	231	6.137	235	0.058	226	0.525	251	0.371	223	6.137	—	NA
166	0.165	245	0.394	185	1.109	241	4.868	162	0.165	242	0.394	182	1.109	234	4.868	—	0
73	1.169	125	3.391	60	14.65	123	41.18	66	1.169	123	3.391	53	14.65	119	41.18	—	0
152	0.212	262	0.324	138	2.277	288	2.180	150	0.212	260	0.324	135	2.277	285	2.180	—	NA
279	0.031	288	0.197	288	0.226	263	3.740	276	0.031	287	0.197	284	0.226	258	3.740	211	0.542
165	0.166	199	0.994	188	1.092	215	8.561	161	0.166	196	0.994	185	1.092	209	8.561	166	1.730
240	0.058	255	0.355	235	0.464	249	4.511	236	0.058	252	0.355	231	0.464	243	4.511	188	1.000
285	0.027	271	0.285	322	0.118	317	1.397	282	0.027	270	0.285	319	0.118	314	1.397	173	1.364
169	0.160	192	1.134	230	0.504	260	4.002	167	0.160	189	1.134	226	0.504	255	4.002	217	0.500

Rank by total assets 1988	Rank by total assets 1987	Company	Total assets $000	Total revenue Rank	Total revenue $000	Net income Rank	Net income $000	Stockholders' equity Rank	Stockholders' equity $000	Capital & expl. spending Rank	Capital & expl. spending $000
256	--	NY Life Oil&Gas Producing Properties II-B,L.P.	7,680	295	1,155	174	108	209	[12]7,308	141	6,121
257	250	Nugget Oil Corp.[92]	7,585	243	2,681	355	(3,622)	382	(5,179)	226	838
258	286	Omni Exploration Inc.[9]	7,477	263	1,890	256	(311)	236	5,010	307	152
259	251	Seahawk Oil International, Inc.	7,460	246	2,459	353	(3,457)	239	4,886	264	315
260	283	Panhandle Royalty Co.[9]	7,388	244	2,609	120	939	230	5,657	230	780
261	—	U.S. Mineral & Royalty Corp.[9,93]	7,354	276	1,595	138	591	231	5,657	236	623
262	—	Prudential-Bache Energy Income Fund 1983P-2	7,303	236	3,044	158	246	257	[12]3,671	325	106
263	291	Prima Energy Corp.[39]	7,071	280	1,461	135	646	229	5,735	319	120
264	—	Prudential-Bache Pension & Retirement LP P8R-4	7,020	300	1,069	175	108	215	[12]7,010	268	303
265	302	Normandy Oil and Gas Co. Inc.[39]	6,837	284	1,367	245	(222)	261	3,563	172	2,644
266	293	Eglinton Oil & Gas Corp.[94]	6,537	308	961	171	143	387	[95](14,420)	246	448
267	274	Lomak Petroleum Inc.	6,527	206	5,546	277	(492)	370	(331)	206	1,377
268	270	NY Life Oil&Gas Producing Properties II-A,L.P.	6,484	272	1,691	178	98	221	[12]6,196	247	441
269	288	Partners Oil Co.	6,444	277	1,594	296	(701)	273	2,892	220	954
270	294	Plexus Resources Corp.[39]	6,415	323	712	298	(736)	278	2,671	335	84
271	282	GeoResources Inc.	6,359	249	2,356	216	(72)	252	3,908	281	261
272	268	NY Life Oil&Gas Producing Properties I-C,Ltd.	6,357	239	2,863	231	(129)	222	[12]6,153	283	255
273	284	Mustang Companies, Inc.	6,315	228	3,468	172	138	226	5,892	234	728
274	279	Pyramid Oil Co.	6,196	225	3,549	308	(889)	233	5,425	298	179
275	—	Prudential-Bache Energy Income Fund 1983P-1	6,186	248	2,358	164	182	269	[12]3,090	331	93
276	252	Wichita River Oil Corp.	5,989	253	2,220	356	(4,018)	254	3,814	228	798
277	298	Magic Circle Energy Corp.	5,988	234	3,089	227	(112)	241	4,611	212	1,178
278	—	Paine Webber/Geodyne Energy Income L.P. I-B	5,905	286	1,356	168	167	225	[12]5,905	341	76
279	292	Basic Earth Science Systems, Inc.[39]	5,768	265	1,882	252	(301)	294	1,992	279	262
280	261	COM-TEK Resources Inc.[9]	5,739	362	378	280	(512)	237	4,938	300	164
281	276	Alta Energy Corp.[39]	5,701	289	1,303	327	(1,349)	333	632	252	400
282	266	Q E D Exploration, Inc.[96]	5,579	261	1,970	319	(1,145)	234	5,183	210	1,295
283	287	Houston Oil Royalty Trust	5,535	330	661	153	[63]310	232	[49]5,535	—	NA
284	281	Golden Oil Co.[39]	5,435	282	1,456	322	(1,198)	253	3,897	338	79
285	—	U.S. Energy Search Inc.	5,292	257	2,109	151	346	372	(589)	156	4,293
286	285	Gold King Consolidated Inc.	5,168	317	800	334	(1,652)	247	4,050	207	1,365
287	—	Paine Webber/Geodyne Energy Income L.P. I-D	5,050	245	2,558	105	1,498	238	[12]4,926	345	63
288	295	Pinnacle Petroleum Inc.	4,856	318	764	314	(1,035)	275	2,858	306	157
289	299	Energy Sources Inc.[95]	4,670	275	1,611	306	(882)	381	(4,826)	297	180
290	335	HarCor Energy Inc.	4,627	279	1,490	317	(1,[illegible]38)	259	3,637	262	332
291	320	Southern Mineral Corp.	4,552	229	3,384	140	448	255	3,810	191	1,809
292	—	Churchill Technology, Inc.[9]	4,478	312	882	278	(504)	295	1,975	372	13
293	301	Strata Corp.	4,430	252	2,269	60	11,485	318	1,039	368	22
294	312	WEXCO of Delaware, Inc.[96]	4,424	315	812	235	(143)	266	3,236	200	1,508
295	322	Energetics, Inc.	4,390	274	1,618	292	(648)	276	2,745	324	109
296	297	Hawks Industries Inc.[97]	4,381	220	3,910	240	(187)	279	2,526	232	737
297	300	NY Life Oil&Gas Producing Properties I-A,Ltd.	4,374	260	1,985	183	73	245	[12]4,143	288	217
298	306	Woodbine Petroleum Inc.[9]	4,327	294	1,160	184	73	274	2,883	271	293
299	304	Altex Industries, Inc.[9]	4,300	319	744	247	(229)	250	4,004	322	110
300	325	International Basic Resources, Inc.[39]	4,286	314	866	146	388	310	1,523	239	588
301	—	Prudential-Bache Pension & Retirement LP PBR-2	4,247	337	620	162	214	243	[12]4,244	—	0
302	308	Greenwood Holdings Inc.	4,191	269	1,827	198	8	263	3,354	282	259
303	307	Dallas Oil & Minerals Inc.	4,169	262	1,964	272	(440)	246	4,089	202	1,448
304	319	Kimco Energy Corp.[39]	4,152	233	3,144	121	900	281	2,366	224	888
305	303	NY Life Oil&Gas Producing Properties I-B,Ltd.	4,133	288	1,323	170	148	249	[12]4,042	294	191
306	329	Questa Oil & Gas Co.	3,979	290	1,268	180	86	309	1,609	216	1,083

Worldwide liquids production		Worldwide natural gas production		Worldwide liquids reserves		Worldwide natural gas reserves		U.S. liquids production		U.S. natural gas production		U.S. liquids reserves		U.S. natural gas reserves		U.S. net wells drilled	
Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Wells
290	0.025	273	0.278	266	0.311	275	2.983	287	0.025	272	0.278	263	0.311	272	2.983	—	NA
264	0.039	209	0.826	278	0.268	213	8.858	261	0.039	205	0.826	274	0.268	206	8.858	101	7.542
212	0.080	236	0.482	216	0.617	245	4.653	209	0.080	232	0.482	213	0.617	239	4.653	189	1.000
201	0.092	241	0.434	153	1.694	238	5.265	198	0.092	237	0.434	148	1.694	231	5.265	179	1.170
254	0.046	195	1.075	303	0.166	221	7.049	251	0.046	192	1.075	299	0.166	215	7.049	214	0.524
246	0.051	289	0.192	205	0.818	222	6.947	242	0.051	288	0.192	202	0.818	216	6.947	254	0.100
160	0.184	280	0.247	151	1.904	296	1.925	158	0.184	279	0.247	147	1.904	293	1.925	—	NA
352	0.006	314	0.109	366	0.024	333	0.925	352	0.006	313	0.109	366	0.024	331	0.925	212	0.540
245	0.053	232	0.521	246	0.410	265	3.590	241	0.053	228	0.521	242	0.410	261	3.590	—	NA
282	0.030	244	0.404	218	0.560	230	6.140	279	0.030	241	0.404	215	0.560	222	6.140	—	0
238	0.059	326	0.083	214	0.654	302	1.777	234	0.059	326	0.083	210	0.654	299	1.777	—	NA
325	0.013	261	0.327	369	0.020	313	1.427	323	0.013	259	0.327	369	0.020	310	1.427	136	3.900
236	0.060	231	0.523	231	0.500	259	4.042	232	0.060	227	0.523	227	0.500	254	4.042	—	NA
344	0.008	323	0.085	344	0.058	240	4.952	344	0.008	323	0.085	343	0.058	233	4.952	208	0.620
353	0.006	307	0.137	337	0.076	274	3.057	353	0.006	306	0.137	336	0.076	271	3.057	261	0.020
213	0.080	—	0	198	0.964	373	0.230	210	0.080	—	0	195	0.964	372	0.230	190	1.000
189	0.108	210	0.815	243	0.432	254	4.230	186	0.108	206	0.815	239	0.432	248	4.230	—	NA
182	0.126	249	0.380	183	1.110	310	1.473	179	0.126	246	0.380	180	1.110	307	1.473	135	4.000
181	0.127	364	0.030	208	0.757	371	0.234	178	0.127	364	0.030	204	0.757	370	0.234	—	0
175	0.144	293	0.184	164	1.535	307	1.534	172	0.144	292	0.184	159	1.535	304	1.534	—	NA
214	0.079	283	0.233	248	0.408	281	2.511	211	0.079	282	0.233	244	0.408	278	2.511	226	0.340
329	0.012	274	0.270	304	0.163	279	2.704	327	0.012	273	0.270	300	0.163	276	2.704	137	3.900
303	0.018	242	0.431	336	0.079	267	3.544	301	0.018	238	0.431	335	0.079	263	3.544	—	NA
199	0.094	295	0.179	240	0.449	270	3.374	196	0.094	294	0.179	236	0.449	266	3.374	199	0.790
315	0.015	332	0.073	191	1.061	223	6.539	317	0.014	345	0.051	192	1.040	236	4.707	—	0
271	0.037	313	0.110	234	0.467	233	6.010	268	0.037	312	0.110	230	0.467	225	6.010	191	0.950
233	0.062	270	0.286	287	0.229	306	1.618	229	0.062	269	0.286	283	0.229	303	1.618	147	3.145
311	0.016	300	0.165	305	0.161	269	3.437	308	0.016	299	0.165	301	0.161	265	3.437	171	1.400
235	0.061	284	0.226	197	1.022	337	0.844	231	0.061	283	0.226	194	1.022	335	0.844	—	0
228	0.069	233	0.515	224	0.531	258	4.062	224	0.069	229	0.515	221	0.531	253	4.062	235	0.250
275	0 033	327	0.081	256	0.368	347	0.611	272	0.033	327	0.081	252	0.368	345	0.611	210	0.600
304	0.018	203	0.883	319	0.123	224	6.394	302	0.018	200	0.883	316	0.123	217	6.394	—	NA
286	0 026	312	0.116	309	0.152	330	1.040	283	0.026	311	0.116	305	0.152	328	1.040	164	1.850
260	0.042	291	0.189	249	0.399	322	1.257	256	0.042	290	0.189	245	0.399	320	1.257	—	0
227	0.070	254	0.359	237	0.462	335	0.887	223	0.070	251	0.359	233	0.462	333	0.887	221	0.440
277	0.032	164	1.766	290	0.221	225	6.385	274	0.032	162	1.766	286	0.221	218	6.385	140	3.713
294	0.023	296	0.171	284	0.240	227	6.318	291	0.023	295	0.171	280	0.240	219	6.318	107	5.900
297	0.021	272	0.283	315	0.128	294	2.009	294	0.021	271	0.283	312	0.128	291	2.009	204	0.700
287	0.026	304	0.147	328	0.102	284	2.356	284	0.026	303	0.147	327	0.102	281	2.356	—	NA
295	0.022	282	0.239	340	0.070	342	0.706	292	0.022	281	0.239	339	0.070	340	0.706	160	2.000
265	0.039	334	0.070	215	0.638	271	3.306	262	0.039	333	0.070	212	0.638	267	3.306	—	0
215	0.077	229	0.530	253	0.385	278	2.712	212	0.077	225	0.530	249	0.385	275	2.712	—	NA
291	0.025	279	0.253	267	0.310	255	4.217	288	0.025	278	0.253	264	0.310	249	4.217	150	2.924
276	0.033	362	0.034	330	0.094	383	0.111	273	0.033	362	0.034	329	0.094	383	0.111	—	0
—	0	367	0.027	—	0	305	1.623	—	0	367	0.027	—	0	302	1.623	—	NA
308	0.017	266	0.311	314	0.133	229	6.284	306	0.017	264	0.311	311	0.133	221	6.284	—	NA
247	0.051	258	0.351	285	0.239	283	2.359	243	0.051	256	0.351	281	0.239	280	2.359	—	0
223	0.071	239	0.464	250	0.393	293	2.036	219	0.071	235	0.464	246	0.393	290	2.036	240	0.214
200	0.094	338	0.066	316	0.127	345	0.674	197	0.094	337	0.066	313	0.127	343	0.674	255	0.100
261	0.042	243	0.426	264	0.315	277	2.845	257	0.042	239	0.426	260	0.315	274	2.845	—	NA
335	0.010	267	0.304	331	0.093	251	4.426	333	0.010	265	0.304	330	0.093	245	4.426	144	3.350

Rank by total assets		Company	Total assets	Total revenue		Net income		Stockholders' equity		Capital & expl. spending	
1988	1987		$000	Rank	$000	Rank	$000	Rank	$000	Rank	$000
307	313	Parallel Petroleum Corp.	3,954	327	690	211	(39)	265	3,261	263	331
308	—	NY Life Oil&Gas Producing Properties II-C,L.P.	3,855	344	552	189	46	256	[12]3,686	166	3,061
309	—	Toreador Royalty Corp.	3,715	347	512	226	(107)	258	3,668	244	505
310	321	Tyrex Oil Co.[39]	3,615	278	1,494	173	119	262	3,496	227	800
311	316	K.R.M. Petroleum Corp.	3,609	270	1,772	192	31	277	2,721	196	1,598
312	—	**Paine Webber/Geodyne Energy Income L.P. I-C**	3,570	296	1,131	288	(596)	260	[12]3,570	364	27
313	—	**Vineyard Oil & Gas Co.**	3,419	281	1,458	363	(5,457)	373	(790)	287	219
314	309	**Great Eastern Energy & Development Corp.**	3,371	271	1,766	312	(987)	271	3,063	299	179
315	—	**Tatum Petroleum Corp.[38]**	3,033	335	625	318	(1,142)	272	2,914	352	52
316	311	**Monogram Oil & Gas Inc.[85,86]**	2,993	303	1,021	249	(239)	383	(5,340)	370	14
317	339	Keldon Oil Co.[56]	2,899	316	810	193	26	316	1,205	373	9
318	330	Chaparral Resources Inc.[83]	2,871	311	884	275	(471)	302	1,747	260	358
319	352	Pioneer Oil & Gas[9]	2,846	285	1,361	167	172	306	1,654	229	793
320	324	NY Life Oil&Gas Producing Properties I-B,Ltd.	2,725	291	1,263	202	0	280	[12]2,433	321	117
321	334	Crescent Oil & Gas Corp.[9]	2,543	364	356	218	(86)	287	2,138	349	57
322	318	**Senergy 1986 Ltd.**	2,532	325	700	228	(115)	289	[12]2,106	291	205
323	333	**Aspen Exploration Corp.[38]**	2,511	363	373	259	(348)	282	2,365	328	103
324	—	**Robson Petroleum Ltd.**	2,502	336	622	286	(586)	299	1,855	329	97
325	—	**Roxana Resources, Ltd.[90]**	2,369	399	16	255	(309)	298	1,871	275	272
326	—	**Prudential-Bache Pension & Retirement LP PBR-1**	2,369	352	478	176	104	283	[12]2,346	353	52
327	343	Broken Arrow Petroleum Co.[18]	2,345	397	69	290	(628)	285	2,213	302	162
328	—	Paine Webber/Geodyne Energy Income L.P. I-A	2,262	338	594	179	87	284	[12]2,262	369	21
329	362	Oxford Consolidated Inc.[38]	2,190	297	1,123	208	(26)	313	1,406	337	82
330	371	Sheffield Exploration Co. Inc.[39]	2,180	305	999	204	(5)	291	2,027	346	63
331	—	Coastal Strategies Income Fund B	2,171	387	144	196	18	286	[12]2,157	261	351
332	351	**Albion International Resources, Inc.**	2,146	365	337	219	(89)	297	1,916	286	223
333	327	**Appalachian Oil & Gas Co., Inc.[38]**	2,144	266	1,862	283	(535)	356	270	266	307
334	337	**Pantepec International, Inc.**	2,138	386	152	253	[100](306)	288	2,117	316	132
335	—	**Imperial Petroleum Inc.[86,101]**	2,136	382	174	229	(120)	304	1,704	—	0
336	—	**Bogert 1985 - II LP**	2,069	302	1,054	302	(808)	292	[12]2,022	357	40
337	340	Penn-Pacific Corp.[9]	2,064	366	295	274	(455)	296	1,935	382	1
338	—	Coastal Strategies Income Fund A	2,062	384	161	197	15	290	[12]2,046	233	731
339	328	Valex Petroleum Inc.[102]	2,049	328	682	307	(887)	368	(243)	251	402
340	344	Taurus Petroleum Inc.[9]	1,919	301	1,055	281	(518)	317	1,094	367	23
341	341	Double Eagle Petroleum and Mining Co.[26]	1,879	331	650	265	(370)	301	1,767	241	586
342	350	**Petrol Industries, Inc.**	1,853	292	1,200	232	(134)	303	1,735	253	398
343	346	**Roseland Oil & Gas, Inc.[9]**	1,834	353	466	246	(222)	321	950	375	4
344	372	**Golden Triangle Royalty & Oil, Inc.**	1,822	385	158	250	(283)	300	1,795	277	263
345	342	**Intramerican Oil & Minerals Inc.**	1,767	351	481	268	(417)	312	1,428	344	68
346	347	**Nova Natural Resources Corp.[9]**	1,763	343	568	273	(447)	305	1,689	336	84
347	345	Plano Petroleum Corp.[9]	1,742	348	490	293	(648)	314	1,369	222	903
348	361	Calcasieu Real Estate & Oil Co. Inc.	1,709	326	696	148	369	307	1,649	384	1
349	348	Roberts Oil and Gas Inc.[18]	1,578	320	733	264	(369)	366	(31)	270	294
350	365	Big Piney Oil & Gas Co.	1,577	368	262	203	(1)	311	1,495	—	0
351	357	General Energy Resources & Technology Corp.	1,568	350	483	251	(291)	346	530	315	133
352	375	**Sharon Energy Ltd.[38]**	1,538	332	645	209	(33)	369	(263)	245	477
353	364	**The Exploration Co.[38]**	1,535	381	178	300	(767)	342	556	347	63
354	269	**Ratex Resources Inc.[9,103]**	1,476	321	718	52	20,750	358	250	258	365
355	363	**Willard Pease Oil & Gas Co.**	1,393	349	490	238	(176)	355	275	351	53
356	336	**Western Energy Resources Inc.**	1,376	369	257	324	(1,211)	315	1,282	376	4
357	370	**[illegible] Exploration Inc.**	1,359	356	441	242	(194)	371	(505)	327	105

Worldwide liquids production		Worldwide natural gas production		Worldwide liquids reserves		Worldwide natural gas reserves		U.S. liquids production		U.S. natural gas production		U.S. liquids reserves		U.S. natural gas reserves		U.S. net wells drilled	
Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Wells
316	0.015	290	0.192	244	0.432	290	2.096	312	0.015	289	0.192	240	0.432	287	2.096	230	0.300
326	0.013	169	1.630	308	0.156	309	1.491	324	0.013	167	1.630	304	0.156	306	1.491	—	NA
—	NA	—	NA	360	0.032	352	0.518	—	NA	—	NA	360	0.032	350	0.518	236	0.250
257	0.044	349	0.045	293	0.215	360	0.400	254	0.044	349	0.045	289	0.215	359	0.400	168	1.530
208	0.081	269	0.295	238	0.460	247	4.571	205	0.081	268	0.295	234	0.460	241	4.571	200	0.750
267	0.038	278	0.254	294	0.210	292	2.063	264	0.038	277	0.254	290	0.210	289	2.063	—	NA
360	0.005	281	0.240	380	0.006	334	0.922	360	0.005	280	0.240	380	0.006	332	0.922	185	1.050
229	0.068	322	0.088	311	0.144	320	1.361	225	0.068	322	0.088	307	0.144	317	1.361	—	0
327	0.013	324	0.084	260	0.357	268	3.488	325	0.013	324	0.084	256	0.357	264	3.488	218	0.500
330	0.012	259	0.347	353	0.038	289	2.152	328	0.012	257	0.347	352	0.038	286	2.152	—	0
280	0.031	316	0.105	252	0.389	329	1.060	277	0.031	315	0.105	248	0.389	327	1.060	—	0
312	0.016	305	0.143	279	0.252	311	1.442	309	0.016	304	0.143	275	0.252	308	1.442	—	0
266	0.039	350	0.045	291	0.221	242	4.848	263	0.039	350	0.045	287	0.221	235	4.848	161	2.000
251	0.048	252	0.365	299	0.194	297	1.873	248	0.048	249	0.365	295	0.194	294	1.873	—	NA
361	0.005	303	0.153	363	0.031	248	4.562	361	0.005	302	0.153	363	0.031	242	4.562	220	0.450
302	0.019	277	0.258	313	0.136	325	1.193	299	0.019	276	0.258	310	0.136	323	1.193	—	NA
321	0.014	378	0.016	286	0.230	365	0.350	318	0.014	378	0.016	282	0.230	364	0.350	114	5.000
309	0.017	301	0.162	210	0.687	226	6.350	334	0.010	300	0.161	211	0.649	227	5.443	—	0
372	0.002	—	0	367	0.022	—	0	372	0.002	—	0	367	0.022	—	0	—	0
278	0.032	292	0.186	269	0.300	326	1.174	275	0.032	291	0.186	266	0.300	324	1.174	—	NA
—	0	389	0.003	—	0	239	4.988	—	0	389	0.003	—	0	232	4.988	—	0
347	0.007	287	0.204	364	0.031	301	1.783	347	0.007	286	0.204	364	0.031	298	1.783	—	NA
255	0.046	375	0.020	181	1.140	314	1.425	252	0.046	375	0.020	178	1.140	311	1.425	—	0
268	0.038	320	0.090	282	0.243	346	0.635	265	0.038	319	0.090	278	0.243	344	0.635	—	0
385	(s)	371	0.024	389	0.002	327	1.076	385	(s)	371	0.024	389	0.002	325	1.076	—	0
322	0.014	346	0.048	259	0.360	318	1.374	319	0.014	346	0.048	255	0.360	315	1.374	—	0
383	0.001	224	0.574	—	0	282	2.492	383	0.001	220	0.574	—	0	279	2.492	154	2.504
373	0.002	333	0.073	361	0.032	339	0.758	373	0.002	332	0.073	361	0.032	337	0.758	237	0.250
362	0.005	381	0.014	312	0.139	369	0.248	362	0.005	381	0.014	309	0.139	368	0.248	—	0
333	0.011	220	0.640	343	0.067	262	3.745	331	0.011	215	0.640	342	0.067	257	3.745	—	0
354	0.006	309	0.134	356	0.034	324	1.210	354	0.006	308	0.134	356	0.034	322	1.210	—	0
384	0.001	351	0.045	381	0.006	295	1.997	384	0.001	351	0.045	381	0.006	292	1.997	—	0
274	0.034	319	0.094	391	0.001	396	0.001	271	0.034	318	0.094	391	0.001	396	0.001	—	0
296	0.022	294	0.181	324	0.115	319	1.368	293	0.022	293	0.181	321	0.115	316	1.368	—	0
281	0.031	369	0.025	297	0.196	331	1.034	278	0.031	369	0.025	293	0.196	329	1.034	201	0.750
224	0.071	366	0.028	91	5.961	—	0	220	0.071	366	0.028	84	5.961	—	0	—	0
331	0.012	344	0.053	332	0.092	355	0.465	329	0.012	343	0.053	331	0.092	354	0.465	—	NA
382	0.001	386	0.005	386	0.004	392	0.027	382	0.001	386	0.005	386	0.004	392	0.027	—	0
336	0.010	298	0.166	350	0.041	280	2.584	335	0.010	297	0.166	349	0.041	277	2.584	242	0.210
317	0.015	348	0.047	310	0.151	354	0.477	313	0.015	348	0.047	306	0.151	353	0.477	—	0
318	0.015	335	0.069	292	0.221	299	1.802	314	0.015	334	0.069	288	0.221	296	1.802	118	4.790
367	0.003	352	0.045	377	0.007	387	0.072	367	0.003	352	0.045	377	0.007	387	0.072	—	0
339	0.009	253	0.361	358	0.033	343	0.698	338	0.009	250	0.361	358	0.033	341	0.698	227	0.340
—	0	306	0.143	—	0	286	2.289	—	0	305	0.143	—	0	283	2.289	—	0
305	0.018	318	0.095	326	0.104	321	1.295	303	0.018	317	0.095	325	0.104	318	1.295	258	0.040
288	0.026	353	0.044	300	0.190	357	0.445	285	0.026	353	0.044	296	0.190	356	0.445	142	3.563
368	0.003	365	0.029	382	0.006	389	0.064	368	0.003	365	0.029	382	0.006	389	0.064	—	0
323	0.014	226	0.556	374	0.012	358	0.437	320	0.014	222	0.556	374	0.012	357	0.437	—	0
306	0.018	343	0.054	182	1.122	264	3.611	304	0.018	342	0.054	179	1.122	260	3.611	—	0
340	0.009	330	0.078	318	0.125	323	1.230	339	0.009	330	0.078	315	0.125	321	1.230	—	0
332	0.012	325	0.084	323	0.116	349	0.540	330	0.012	325	0.084	320	0.116	347	0.540	225	0.405

Rank by total assets 1988	Rank by total assets 1987	Company	Total assets $000	Total revenue Rank	Total revenue $000	Net income Rank	Net income $000	Stockholders' equity Rank	Stockholders' equity $000	Capital & expl. spending Rank	Capital & expl. spending $000
358	353	**Hailey Energy Corp.**	1,315	333	637	258	(344)	319	984	366	24
359	374	**Reserve Exploration Co.**[38]	1,252	345	539	221	(94)	340	572	274	277
360	—	**Lynx Exploration Co.**[9]	1,210	322	713	233	(138)	328	746	340	77
361	376	**DOL Resources, Inc.**	1,188	391	115	213	(51)	337	597	—	0
362	360	**Lyric Energy Inc.**[92]	1,119	367	294	305	(875)	376	(1,620)	361	30
363	394	**Tri-Valley Corp.**[98]	1,084	329	664	188	47	330	709	269	299
364	—	**South Texas Drilling & Exploration, Inc.**[38]	1,054	268	1,845	248	(233)	326	764	354	51
365	366	**Morrison Nuclear Inc.**[104]	1,044	346	523	241	(188)	378	(3,244)	—	0
366	356	**Struthers Oil & Gas Corp.**[105]	1,011	306	967	154	301	353	338	332	93
367	—	**Coastal Strategies Income Fund C**	996	398	36	207	(20)	320	[12]984	256	372
368	378	**Toklan Oil Corp.**[29]	972	341	579	217	(77)	336	607	313	138
369	386	**Texas Vanguard Oil Co.**	967	340	583	187	51	329	725	296	182
370	391	**Minex Resources Inc.**[93]	966	378	187	195	21	322	914	377	4
371	—	**Stellar Petroleum Inc.**[9]	942	395	71	237	(167)	323	838	383	1
372	369	**International Management & Research Corp.**	938	372	234	301	(802)	339	575	363	28
373	355	**Twin Richfield Oils, Inc.**[40]	902	374	200	304	(838)	374	(847)	381	2
374	388	**Eagle Exploration Co.**[38]	901	334	627	70	6,937	331	696	278	263
375	377	**EMC Energies, Inc.**[39]	858	357	437	262	(360)	362	152	303	161
376	—	**Bogert 1985 - IV LP**	848	339	588	303	(834)	324	[12]827	378	4
377	—	**Wyoming Oil & Minerals, Inc.**[91]	842	376	189	201	3	348	481	379	3
378	290	**Republic Resources Corp.**	827	324	708	329	(1,452)	365	90	371	14
379	385	**Bolyard Oil & Gas Ltd.**[92]	822	379	185	214	(63)	352	389	380	3
380	—	**Standard Oil & Exploration of Delaware Inc.**	805	309	935	185	57	327	748	318	122
381	396	**Amacan Resources Corp.**[92]	793	371	246	199	7	325	777	374	8
382	380	**Bogert 1985 - III LP**	787	342	574	222	(96)	332	[12]679	330	95
383	379	**Love Oil Co. Inc.**[10]	767	392	115	291	(647)	335	625	243	510
384	397	**Oil City Petroleum Inc.**[38]	744	377	188	243	(200)	354	291	365	26
385	384	**International Royalty & Oil Co.**[9,106]	733	393	111	299	(758)	375	(1,524)	334	87
386	381	**TPEX Exploration Inc.**[38]	730	354	452	239	(176)	347	508	320	119
387	—	**Sooner Energy Corp.**	677	355	450	282	(525)	350	429	293	199
388	—	**Petrotech, Inc.**	671	373	220	194	26	343	556	343	69
389	398	**Yellowstone Resources, Inc.**	625	388	132	223	(98)	338	595	301	163
390	—	**Mexco Energy Corp.**[38]	608	370	250	200	5	341	566	333	90
391	—	**Caplan Corp.**[39]	592	375	196	224	(100)	357	268	360	31
392	—	**Triumph Oil & Gas Corp.**[39]	530	310	893	236	(165)	363	141	348	60
393	399	**Hipoint Investments, Ltd.**	514	361	391	294	(653)	389	(20,721)	359	34
394	—	**Circle Seven Oil & Gas Inc.**[18]	513	383	167	230	(124)	349	472	350	57
395	400	**Rekan Mesle Energy Fund III, Ltd.**	434	360	393	210	(35)	351	424	—	0
396	—	**Croff Oil Co.**	326	389	121	205	(5)	360	205	—	0
397	—	**Amber Resources Co.**	265	390	117	257	(338)	367	(75)	292	203
398	—	**Black Dome Energy Corp.**	264	394	101	244	(201)	361	162	304	159
399	—	**Rockwell Drilling Co.**	258	359	420	132	710	364	139	326	106
400	—	**Pan Energy Resources, Inc.**[38]	251	396	71	215	(65)	359	222	362	29
		Totals	468,457,403		432,613,571		22,264,666		164,323,494		50,067,971

NA = Not Available. (s) indicates less than 500 bbl or 500 mcf. Fiscal yearend is Dec. 31 unless otherwise noted. 1. Subsidiary of British Petroleum Co. plc. 2. Net income before interest and income tax. 3. Includes 2 operating entities, Marathon Oil Co. and Texas Oil & Gas Corp. 4. Subsidiary of E.I. du Pont de Nemours & Co. 5. After-tax operating income. 6. May include insignificant amounts outside U.S. 7. Does not include natural gas systems. 8. Changed accounting method from full cost to successful efforts on June 30. 9. Fiscal yearend Sept. 30. 10. Includes both cost-of-service and non-cost-of-service. 11. Formerly Sun Exploration & Production Co. 12. Partners' capital. 13. Subsidiary of Burlington Resources Inc. 14. Fiscal yearend Jan. 31, 1989. 15. Subsidiary of Union Pacific Corp. 16. Unocal Corp. owns 95.1%. 17. Freeport McMoRan Inc. and affiliates own 76.6%. 18. Fiscal yearend May 31. 19. Subsidiary of Pacific Enterprises. 20. Includes acquisitions of Sabine Corp. and Burnett Ranch. 21. One subsidiary uses successful efforts accounting method, and two use full cost. 22. Murphy Oil owns 61%. 23. Subsidiary of Santa Fe Southern Pacific. 24. Operating income. 25. ENSEARCH owns 87%. 26. Fiscal yearend Aug. 31. 27. Subsidiary of Total Compagnie Francaise des Petroles. 28. Subsidiary of W.R. Grace & Co. 29. Identifiable assets. 30. Transco Exploration Co. owns 73%. 31. Includes acquisitions. 32. Since fiscal yearend, under Chapter 11 Bankruptcy Reorganization Plan. 33. Since fiscal yearend, has completed sale of oil & gas properties to RAMCO. 34. Partners' capital less demand notes receivable. 35. Formerly a subsidiary of DEKALB Corp., now an independent. 36. Subsidiary of NERCO Minerals Co. 37. Santa Fe Southern Pacific owns 85%. 38. Fiscal yearend is March 31. 39. Fiscal yearend is June 30. 40. Capital stock and members' equity. 41. Maxus Energy Corp. owns 82.4% of units. 42. U.S. operations only. 43. Subsidiary of AMAX Inc. 44. Subsidiary of CMS Energy Corp. 45. Subsidiary of Hiram Walker Resources Ltd. 46. Formerly Harken Oil & Gas Inc. 47. Snyder Oil Co. holds 10% interest. 48. Subsidiary of Bridge Oil Ltd. 49. Trust corpus. 50. Subsidiary of CBI Industries Inc. 51. Emerging from Chapter 11 Reorganization Plan 12/88. 52. Subsidiary of Brooklyn Union Gas Co. 53. Samson Properties Inc. owns 26.4%. 54. Southmark Corp. owns 94% of stock. Operating under Bankruptcy Reorganization Plan. 55. Net figure. 56. Subsidiary of Public Service of Colorado. 57. Kelley Oil has 1.99% interest. 58. Apache

Worldwide liquids production		Worldwide natural gas production		Worldwide liquids reserves		Worldwide natural gas reserves		U.S. liquids production		U.S. natural gas production		U.S. liquids reserves		U.S. natural gas reserves		U.S. net wells drilled	
Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Wells
—	0	383	0.009	375	0.012	344	0.677	—	0	383	0.009	375	0.012	342	0.677	—	NA
292	0.025	361	0.035	263	0.319	380	0.121	289	0.025	361	0.035	259	0.319	380	0.121	219	0.500
328	0.013	357	0.039	227	0.511	350	0.534	326	0.013	357	0.039	224	0.511	348	0.534	182	1.070
363	0.004	373	0.022	351	0.039	377	0.139	363	0.004	373	0.022	350	0.039	377	0.139	—	0
369	0.003	336	0.067	341	0.070	272	3.285	369	0.003	335	0.067	340	0.070	268	3.285	122	4.453
—	0	358	0.039	—	0	388	0.072	—	0	358	0.039	—	0	388	0.072	—	0
377	0.001	393	0.001	379	0.007	394	0.009	377	0.001	393	0.001	379	0.007	394	0.009	238	0.240
272	0.035	390	0.001	317	0.126	—	0	269	0.035	390	0.001	314	0.126	—	0	—	0
378	0.001	328	0.081	383	0.006	353	0.496	378	0.001	328	0.081	383	0.006	352	0.496	257	0.047
388	(s)	385	0.007	392	0.001	348	0.549	388	(s)	385	0.007	392	0.001	346	0.549	—	0
341	0.009	286	0.219	327	0.104	328	1.068	340	0.009	285	0.219	326	0.104	326	1.068	198	0.800
319	0.015	347	0.048	258	0.361	315	1.408	315	0.015	347	0.048	254	0.361	312	1.408	93	10.19
374	0.002	391	0.001	342	0.069	385	0.089	374	0.002	391	0.001	341	0.069	385	0.089	—	0
375	0.002	—	0	338	0.072	340	0.744	375	0.002	—	0	337	0.072	338	0.744	—	0
—	0	363	0.032	—	0	356	0.456	—	0	363	0.032	—	0	355	0.456	—	0
—	0	308	0.135	—	0	304	1.682	—	0	307	0.135	—	0	301	1.682	—	0
313	0.016	321	0.089	359	0.033	370	0.247	310	0.016	321	0.089	359	0.033	369	0.247	175	1.285
342	0.009	368	0.027	307	0.159	361	0.398	341	0.009	368	0.027	303	0.159	360	0.398	203	0.718
348	0.007	264	0.321	347	0.049	285	2.320	348	0.007	262	0.321	346	0.049	282	2.320	—	0
345	0.008	376	0.018	333	0.089	338	0.761	345	0.008	376	0.018	332	0.089	336	0.761	—	0
370	0.003	374	0.021	378	0.007	386	0.078	370	0.003	374	0.021	378	0.007	386	0.078	—	0
379	0.001	337	0.067	387	0.003	303	1.721	379	0.001	336	0.067	387	0.003	300	1.721	—	0
364	0.004	382	0.010	346	0.052	300	1.800	364	0.004	382	0.010	345	0.052	297	1.800	—	0
343	0.009	360	0.036	348	0.046	368	0.261	342	0.009	360	0.036	347	0.046	367	0.261	—	0
337	0.010	276	0.265	345	0.057	312	1.428	336	0.010	275	0.265	344	0.057	309	1.428	—	0
355	0.006	392	0.001	371	0.015	395	0.002	355	0.006	392	0.001	371	0.015	395	0.002	222	0.440
349	0.007	387	0.005	329	0.101	391	0.048	349	0.007	387	0.005	328	0.101	391	0.048	—	0
381	0.001	388	0.004	365	0.029	393	0.015	381	0.001	388	0.004	365	0.029	393	0.015	—	0
324	0.014	339	0.066	334	0.084	359	0.401	321	0.014	338	0.066	333	0.084	358	0.401	—	0
365	0.004	302	0.155	373	0.014	364	0.387	365	0.004	301	0.155	373	0.014	363	0.387	234	0.260
386	(s)	310	0.134	390	0.002	332	0.965	386	(s)	309	0.134	390	0.002	330	0.965	—	0
350	0.007	384	0.008	362	0.032	390	0.060	350	0.007	384	0.008	362	0.032	390	0.060	256	0.075
346	0.008	354	0.044	349	0.043	367	0.265	346	0.008	354	0.044	348	0.043	366	0.265	260	0.030
356	0.006	370	0.025	370	0.018	375	0.163	356	0.006	370	0.025	370	0.018	375	0.163	223	0.440
357	0.006	377	0.018	357	0.034	376	0.152	357	0.006	377	0.018	357	0.034	376	0.152	100	8.195
334	0.011	331	0.077	354	0.037	366	0.343	332	0.011	331	0.077	353	0.037	365	0.343	246	0.200
371	0.003	342	0.055	376	0.010	372	0.232	371	0.003	341	0.055	376	0.010	371	0.232	247	0.175
351	0.007	299	0.166	372	0.015	362	0.394	351	0.007	298	0.166	372	0.015	361	0.394	—	0
366	0.004	380	0.015	352	0.039	382	0.115	366	0.004	380	0.015	351	0.039	382	0.115	—	0
376	0.002	355	0.044	388	0.003	384	0.091	376	0.002	355	0.044	388	0.003	384	0.091	—	0
320	0.015	329	0.079	355	0.035	336	0.870	316	0.015	329	0.079	355	0.035	334	0.870	—	0
358	0.006	372	0.024	368	0.021	381	0.121	358	0.006	372	0.024	368	0.021	381	0.121	—	0
380	0.001	379	0.016	384	0.005	379	0.132	380	0.001	379	0.016	384	0.005	379	0.132	—	0
	3,666.0		**13,481.7**		**36,566.9**		**172,011.7**		**2,312.6**		**10,123.2**		**22,949.8**		**116,041.3**		**10,043.1**

Corp. owns 4%. 59. Formerly The Beard Co. 60. Subsidiary of Penn Virginia Corp. Oil & gas operations only. 61. Loss before taxes, interest, depreciation, and depletion. 62. Includes investment in real estate. 63. Distributable cash. 64. Subsidiary of Coho Resources Ltd. 65. Under a Chapter 11 Reorganization Plan. 66. Subsidiary of Gulf Resources & Chemical Corp. 67. Subsidiary of Northwest Natural Gas. 68. Subsidiary of MDU Resources Group Inc. 69. Callon Petroleum Co. owns 2.3%. 70. Energy Development Partners owns 68% of stock. 71. Mission Partners owns 9.9% 72. Formerly Walker Energy Partners. 73. U.S. operations of Inter-City Gas Corp.-Resources Division. 74. Subsidiary of Energen Corp. 75. Includes coalbed methane reserves. 76. Financial data converted from Canadian dollars using exchange rates in effect at fiscal yearend. 77. Saxon Oil Co. owns 67%. 78. ConVest Energy Corp. owns 12.3%. 79. Subsidiary of DEMINEX Deutsche Erdolversorgungsgesellschaft mbH. 80. Filed Chapter 11 petition June 1988. 81. Fiscal yearend Feb. 28, 1989. 82. Since fiscal yearend, company is liquidating. 83. Fiscal yearend Nov. 30. 84. Columbus Energy Corp. owns 15.77%. Consolidated Oil & Gas owns 56.52%. 85. Fiscal yearend Oct. 31. 86. Fiscal yearend July 31. 87. Caspen Oil plc owns 71%. Formerly Summit Energy Inc. 88. Changed accounting methods from successful efforts to full cost in the third quarter. 89. Before interest, including tax and extraordinary. 90. Since fiscal yearend, acquired Barfield Oil Corp. 91. Canadian chartered company which operates exclusively in the U.S. 92. Fiscal yearend April 30. 93. Operating under Chapter 11 Reorganization Plan. 94. Subsidiary of Eglinton Exploration plc. 95. Includes foreign currency reserve. 96. Subsidiary of WICOR, Inc. 97. Formerly Burton/Hawks Inc. 98. Operating under bankruptcy plans. 99. U.S. operating subsidiary of Roxana Resources Ltd. 100. Net operating loss. 101. Petro Imperial Corp. owns 56.4%. 102. Company going private. 103. Company assigned $5,873,553 in oil & gas properties to FDIC to settle debts owed. 104. U.S. operating subsidiary of Morrison Petroleums Ltd. 105. Subsidiary of Aleph, Inc. 106. Since fiscal yearend, company has sold most domestic producing royalty interest.

Leading oil and gas companies around the world

Country	Company	Total assets		Total revenues		Total net income		Capital and exploratory expenditures	
		$ million							
		1988	1987	1988	1987	1988	1987	1988	1987
CANADA									
Canada	Alberta Energy Co. Ltd.	1,619.3	1,430.1	390.9	350.1	41.8	38.8	129.2	114.2
Canada	American Eagle Petroleum Ltd.	98.9	73.4	28.1	19.3	(0.7)	(1.8)	24.0	9.1
Canada	American Hunter Exploration Ltd.	71.7	49.8	12.9	0.2	(8.6)	(11.4)	13.2	6.8
Canada	Amoco Canada Petroleum Co. Ltd.	6,072.3	1,659.7	1,690.3	1,140.2	(42.5)	109.9	203.8	111.1
Canada	Bow Valley Industries Ltd.	1,114.9	754.3	217.6	194.0	8.4	35.2	407.2	118.5
Canada	BP Canada Inc.	736.7	648.5	[2]249.4	[2]231.2	8.4	33.7	229.7	139.0
Canada	Canadian Hunter Exploration Ltd.	443.4	431.0	93.0	65.3	[4](58.2)	11.9	90.0	58.7
Canada	Canada Northwest Energy Ltd.	391.3	458.9	91.2	67.9	(91.1)	15.2	71.3	92.1
Canada	Canadian Occidental Petroleum Ltd.	1,136.9	1,137.3	601.3	451.7	43.3	43.7	119.0	156.6
Canada	Canadian Roxy Petroleum Ltd.	159.7	144.0	17.2	17.8	(0.8)	1.2	11.2	11.8
Canada	Canadian Western Natural Gas Co. Ltd.	334.0	291.5	242.1	233.1	12.5	10.6	22.2	22.2
Canada	Chevron Canada Resources	918.6	751.5	643.5	689.3	88.4	145.5	299.4	171.6
Canada	Cooperative Energy Development Corp.	175.2	156.0	21.2	20.2	(0.6)	0.9	15.5	21.4
Canada	Conwest Exploration Co. Ltd.	292.8	233.5	79.4	79.7	10.5	25.5	12.8	7.9
Canada	Denison Mines Ltd.	[6]231.1	[6]369.0	[6]113.6	[6]133.0	[6,7]11.0	[6,7]49.0	[6]22.5	[6]39.5
Canada	Gulf Canada Resources Ltd.	3,116.4	2,531.2	[9]707.2	[9]335.7	[9]54.5	[9]73.9	[9]301.6	[9]178.8
Canada	Home Oil Company Ltd.	2,513.9	2,271.4	195.4	199.4	15.4	15.1	0.2	0.1
Canada	Imperial Oil Ltd.	8,112.6	7,291.9	5,857.1	5,786.8	407.3	561.9	1,118.6	1,098.2
Canada	Interhome Energy Inc.	[11]2,513.9	[11]2,271.4	[11]697.7	[11]646.9	[11]97.0	[11]92.3	[11]263.8	[11]204.6
Canada	Inverness Petroleum Ltd.	72.8	55.6	16.1	5.6	(0.4)	(1.8)	9.9	3.4
Canada	Norcen Energy Resources Ltd.	1,941.0	1,718.4	594.7	554.2	74.5	74.8	206.6	108.5
Canada	Paloma Petroleum Ltd.	72.6	60.9	13.5	10.4	2.7	3.1	11.5	6.9
Canada	PanCanadian Petroleum Ltd.	2,241.9	1,811.0	561.2	527.0	101.2	136.6	[13]590.4	161.6
Canada	Petro-Canada	7,219.7	6,503.3	3,902.8	3,830.9	76.4	129.7	649.5	364.3
Canada	Placer Dome Inc.	336.1	335.9	[15]72.8	[15]82.5	(12.6)	7.2	49.8	46.5
Canada	Prairie Oil Royalties Co., Ltd.	83.1	72.0	12.3	12.8	2.9	5.2	[16]24.3	[16]9.6
Canada	Ranger Oil Ltd.	458.6	362.2	94.7	72.7	15.4	17.9	98.8	20.0
Canada	Saskatchewan Oil and Gas Corp.	569.5	285.6	[17]95.3	[17]91.2	(7.1)	17.0	67.7	39.6
Canada	Sceptre Resources Ltd.	399.7	584.7	74.1	48.9	5.1	6.2	49.1	26.4
Canada	Scurry-Rainbow Oil Ltd.	272.5	257.5	57.1	61.2	12.3	17.5	60.1	32.2
Canada	Shell Canada Ltd.	4,707.8	4,238.3	4,113.4	3,663.5	347.1	264.0	360.1	304.7
Canada	Sunoco Inc.	1,696.1	1,600.2	1,093.4	1,033.3	(39.8)	36.2	165.0	107.1
Canada	Teck Corp.	[18]698.4	486.7	201.6	153.5	75.3	25.4	16.0	3.1
Canada	Texaco Canada Inc.[19]	3,435.0	2,979.7	2,164.0	2,115.0	270.7	241.4	332.5	189.3
Canada	Total Petroleum (North America) Ltd.	962.9	780.2	1,833.5	1,317.7	72.7	(20.2)	116.9	99.5
Canada	Union Enterprises Ltd.	1,511.7	NA	1,132.0	NA	46.9	NA	121.9	NA
Canada	Westcoast Petroleum Ltd.	635.7	584.3	88.8	81.2	14.5	19.4	59.5	153.3
LATIN AMERICA									
Argentina	Yacimentos Petroliferos Fiscales SE	NA	NA	NA	NA	NA	NA	NA	NA
Bolivia	Yacimentos Petroliferos Fiscales Boliviano	NA	NA	NA	NA	NA	NA	NA	NA
Brazil	Petroleo Brasilieiro SA	13,691.6	15,576.3	[20]12,969.3	[20]15,604.6	265.3	93.8	2,172.0	3,057.0
Chile	Empresa Nacional del Petroleo	NA	NA	NA	NA	NA	NA	NA	NA
Colombia	Empresa Colombiana de Petroleos	NA	2.4	NA	2.0	NA	0.1	NA	145.5
Ecuador	Corporacion Estatal Petrolera Ecuatoriana	NA	NA	NA	NA	NA	NA	NA	NA
Mexico	Petroleos Mexicanos	46,155.0	34,729.4	[21]13,125.6	[21]13,240.7	574.7	1,887.8	1,006.3	834.0
Peru	Petroleos del Peru	NA	NA	NA	NA	NA	NA	NA	NA
Suriname	State Oil Co. Suriname NV	33.1	25.4	13.8	12.7	0.6	1.8	13.7	7.4
Venezuela	Petroleos de Venezuela SA	27,255.0	26,873.7	9,512.7	10,928.4	801.1	1,420.1	108.7	138.5
West Indies	Barbados National Oil Co. Ltd.	20.1	19.5	8.5	6.8	0.6	(2.2)	4.4	4.2
WESTERN EUROPE									
Austria	OMV Aktiengesellschaft	NA	NA	NA	NA	NA	NA	NA	NA
Belgium	Petrofina SA	9,575.2	8,552.3	13,591.7	11,757.2	548.6	409.8	1,765.3	883.8
Denmark	Dansk Olie Og Naturgas AS	1,561.1	1,777.7	613.3	647.5	(43.2)	7.6	72.6	49.2
France	Soc. Nat. Elf Aquitaine	NA	28,765.7	NA	22,501.2	1,177.6	691.1	3,869.4	3,048.2

Worldwide oil production Mill bbl		Worldwide natural gas production Bcf		Worldwide oil reserves Mill bbl		Worldwide natural gas reserves Bcf	
1988	1987	1988	1987	1988	1987	1988	1987
[1]2.4	[1]1.8	[1]102.5	[1]85.0	20.7	NA	1,740.0	NA
0.4	0.3	1.9	1.7	5.5	4.3	67.8	38.3
0.0	0.0	0.0	0.0	NA	NA	NA	NA
24.0	21.0	203.0	114.2	317.0	117.3	4,901.0	2,135.0
14.0	12.9	51.7	21.9	71.2	73.8	974.6	494.4
[3]8.8	[3]8.5	48.3	47.5	[3]182.2	[3]187.5	782.9	786.5
2.7	2.0	58.2	37.6	[5]0.1	[5]0.1	[5]1,393.0	[5]1,342.0
5.5	3.4	10.5	8.7	93.6	90.2	213.1	200.7
8.8	8.7	74.5	56.5	90.9	86.8	1,044.6	869.5
1.0	1.0	4.3	4.3	16.6	16.5	124.2	125.3
0.0	0.0	4.0	3.3	0.0	0.0	130.2	134.0
33.6	29.8	70.2	75.7	456.0	453.0	1,607.0	1,672.0
1.0	0.9	7.0	5.7	12.5	11.2	144.0	114.8
0.8	0.6	5.1	4.5	[5]16.3	[5]9.2	[5]128.2	[5]94.4
9.4	8.9	5.2	4.9	95.0	95.0	65.0	72.0
8.0	7.4	136.6	116.3	[8]209.0	[8]196.0	[8]1,572.0	[8]1,453.0
11.9	0.0	0.1	0.1	115.6	107.3	1,050.3	959.1
[10]97.7	[10]89.4	[10]143.5	[10]92.7	[8]1,631.0	[8]1,489.0	[8]2,478.0	[8]1,914.0
10.0	9.5	54.2	41.5	93.8	89.3	1,050.3	959.1
0.7	0.3	4.1	2.0	6.0	4.3	45.9	39.2
16.4	15.4	66.8	55.8	[5]134.0	[5]125.6	[5]1,164.9	[5]1,143.6
0.4	0.3	9.9	7.4	[12]2.9	[12]2.8	[12]156.9	[12]152.7
[14]26.5	[14]21.8	[14]149.0	[14]125.0	[14]440.3	[14]263.4	[14]3,242.0	[14]3,508.0
33.5	32.9	177.6	158.8	[5]779.7	[5]753.1	[5]4,074.6	[5]4,008.6
2.7	3.2	16.7	16.6	[12]16.4	[12]16.7	[12]193.1	[12]161.2
0.8	0.7	3.1	2.2	7.1	4.4	64.4	52.0
5.3	4.4	9.5	7.3	31.4	21.6	99.8	107.3
6.6	5.6	21.1	4.2	[5]86.7	[5]83.3	[5]928.0	[5]94.7
3.3	2.2	38.9	19.9	[5]33.6	[5]32.7	[5]548.9	[5]552.9
3.6	3.5	13.6	0.0	28.0	24.0	258.6	206.0
19.8	20.3	187.4	167.5	140.9	145.9	3,340.3	3,206.1
23.0	21.1	29.7	23.2	358.5	390.0	388.4	423.7
0.5	0.5	2.9	2.7	4.5	3.8	48.0	53.2
27.5	25.2	54.2	38.7	305.0	310.0	1,514.0	1,529.0
4.7	5.0	[1]22.0	[1]0.0	32.0	39.9	269.1	339.4
2.1	NA	12.7	NA	29.3	NA	533.0	NA
5.6	4.4	21.6	16.6	65.3	65.4	719.4	707.3
161.1	156.2	757.4	659.6	2,268.0	2,270.0	26,700.0	23,600.0
NA	5.3	NA	NA	NA	NA	NA	NA
211.2	215.4	0.0	0.0	2,816.0	2,550.0	3,845.3	3,718.1
8.9	11.2	56.3	70.8	287.0	290.0	4,200.0	4,200.0
NA	28.1	NA	140.6	NA	2,028.0	NA	3,943.4
69.9	41.2	NA	NA	NA	NA	NA	NA
917.4	927.3	1,273.1	1,276.9	53,012.0	54,110.0	73,356.0	74,831.0
51.7	60.4	46.1	46.0	457.0	512.0	623.0	650.0
1.2	0.8	0.0	0.0	30.0	23.0	0.0	0.0
627.7	559.9	1,343.7	1,275.6	58,504.0	58,084.0	101.0	100.3
0.5	0.5	1.1	1.1	3.3	3.6	6.8	7.4
6.9	5.8	NA	NA	NA	NA	NA	NA
41.5	38.4	151.2	132.7	0.0	0.0	4.5	3.9
35.1	34.1	84.6	85.7	861.0	440.0	4,320.0	4,400.0
232.0	214.4	829.3	890.0	NA	1,346.0	NA	4,819.8

Leading oil and gas companies around the world (continued)

Country	Company	Total assets		Total revenues		Total net income		Capital and exploratory expenditures	
		$ million							
		1988	1987	1988	1987	1988	1987	1988	1987
France	**Total CFP**	14,515.1	14,051.3	14,012.2	14,448.5	328.9	212.4	2,414.5	1,423.5
Germany, West	**Deminex**	1,741.3	1,707.2	513.5	668.7	NA	NA	485.0	266.4
Germany, West	**Wintershall AG**	NA	1.5	NA	2.1	NA	0.0	NA	0.1
Italy	**Ente Nazionale Idrocarburi**	22,729.5	22,978.1	25,487.0	24,495.6	1,013.3	546.6	1,512.3	1,957.8
Netherlands	**Royal Dutch/Shell**	57,999.9	55,811.9	99,440.9	98,024.2	5,239.0	4,639.7	9,243.5	7,125.9
Norway	**Norsk Hydro AS**	10,097.1	9,700.7	9,224.2	8,098.7	317.3	206.8	1,357.8	1,453.2
Norway	**Saga Petroleum SA**	1,641.2	1,505.5	222.8	211.6	7.8	0.0	14.2	18.1
Norway	**Statoil**	7,118.0	7,046.6	5,789.0	6,303.6	61.2	(216.9)	1,374.7	1,556.5
Spain	**Repsol SA**	6,306.0	6,291.0	8,193.0	7,839.0	486.0	386.0	538.0	373.0
Switzerland	**International Petroleum Corp.**	28.8	27.1	[27]9.5	12.5	(10.8)	(5.1)	22.5	8.4
Turkey	**Turkish Petroleum Corp.**	755.9	1,077.5	[28]147.2	[28]200.0	[4]238.9	[4]429.8	136.4	139.4
United Kingdom	**British Petroleum Co. plc**	21,952.9	21,089.9	46,176.4	46,426.8	2,155.4	2,279.7	10,390.7	5,868.9
United Kingdom	**Clyde Petroleum plc**	[30]537.1	[30]227.9	71.8	60.3	5.5	6.7	271.7	48.8
United Kingdom	**London and Scottish Marine Oil plc**	1,172.7	521.8	240.5	242.6	397.4	36.5	110.4	105.1
AFRICA									
Algeria	**Sonatrach**	NA	NA	NA	NA	NA	NA	NA	NA
Benin	**Projet Petrolier Seme-Ashland**	57.5	97.9	27.1	31.0	21.6	25.3	23.5	17.3
Libya	**National Oil Corp.**	NA	NA	NA	NA	NA	NA	NA	NA
Morocco	**Office Nat. de Recherches & D'Exploitation Petroliere**	NA	NA	NA	NA	NA	NA	NA	NA
Nigeria	**Nigerian National Petrol. Corp.**	NA	NA	NA	NA	NA	NA	NA	NA
MIDDLE EAST									
Abu Dhabi	**Abu Dhabi National Oil Co.**	NA	NA	NA	NA	NA	NA	NA	NA
Bahrain	**Bahrain National Oil Co.**	NA	NA	NA	NA	NA	NA	NA	NA
Dubai	**Dubai Petroleum Co.**	NA	NA	NA	NA	NA	NA	NA	NA
Iran	**National Iranian Oil Co.**	NA	NA	NA	NA	NA	NA	NA	NA
Iraq	**Iraq National Oil Co.**	NA	NA	NA	NA	NA	NA	NA	NA
Israel	**Isramco Inc.**	3.2	3.6	0.2	0.3	(0.3)	(0.9)	0.1	0.9
Kuwait	**Kuwait Petroleum Corp.**[31]	21,411.0	21,810.1	12,333.8	10,631.6	432.8	252.9	982.0	851.7
Oman	**Petroleum Development Oman**	NA	NA	NA	NA	NA	NA	NA	NA
Qatar	**Qatar General Pet. Corp.**	NA	NA	NA	NA	NA	NA	NA	NA
Saudi Arabia	**Arabian American Oil Co.**	NA	NA	NA	NA	NA	NA	NA	NA
Syria	**Syrian Petroleum Co.**	NA	NA	NA	NA	NA	NA	NA	NA
ASIA PACIFIC									
Australia	**BHP Petroleum Pty Ltd.**	5,151.7	3,340.9	2,309.4	1,773.9	285.5	202.5	519.0	309.7
Australia	**Bridge Oil Ltd.**	502.3	323.6	49.6	38.2	20.7	15.1	116.0	24.6
Australia	**Crusader Ltd.**	198.2	160.4	76.8	51.7	6.3	3.3	17.6	10.8
Australia	**Hartogen Energy Ltd.**	NA	206.5	30.3	20.1	9.3	5.2	NA	36.4
Australia	**Magellan Petroleum Australia Ltd.**	38.1	35.6	13.1	9.1	4.3	0.7	1.6	3.8
Australia	**Meridian Oil NL**	11.7	3.6	0.2	1.4	3.2	(8.7)	0.9	3.2
Australia	**Petroz NL**	109.0	202.9	83.6	37.6	(76.1)	(17.2)	9.3	7.6
Australia	**Santos Ltd.**	2,401.7	1,709.4	395.8	425.6	1.7	82.1	450.7	476.7
Burma	**Myanma**	NA	NA	NA	NA	NA	NA	NA	NA
India	**Oil and Natural Gas Commission**	NA	NA	NA	NA	NA	NA	NA	NA
Indonesia	**Pertamina**	NA	NA	NA	NA	NA	NA	NA	NA
Japan	**Idemitsu Kosan Co. Ltd.**	9,982.4	NA	12,175.7	NA	10.0	NA	NA	NA
Korea	**Yukong Ltd.**	1,883.8	1,425.8	3,379.1	3,229.6	84.8	52.1	384.0	264.0
Malaysia	**Petronas**	8,046.9	8,356.4	2,588.8	2,308.3	854.9	938.2	158.5	92.1
New Zealand	**New Zealand Oil & Gas Ltd.**	25.3	19.5	17.7	1.8	6.9	0.0	5.8	1.5
New Zealand	**Southern Petroleum No Liability**	33.9	31.0	4.5	1.6	2.4	(4.5)	27.9	21.8
Philippines	**Philippine National Oil Co.**	1,300.1	1,344.6	974.0	889.3	60.5	36.4	35.6	32.4
Taiwan (China)	**Chinese Petroleum Corp.**	8,674.2	7,642.8	7,514.7	7,388.8	2,170.9	2,219.3	963.6	748.5

NA = Not Available. Fiscal yearend is Dec. 31 unless otherwise noted. 1. Sales only. 2. After royalties. 3. Includes Bitumen. 4. After unusual writedown of $75,758. 5. Proved and probable. 6. Oil and gas only. 7. Operating Income. 8. Proved and undeveloped. 9. 6 mths only—acquisition of Gulf Canada Corp. Oil & Gas Division. 10. Gross. 11. Oil, gas and pipeline only. 12. Proved. 13. Includes $438.3 million for net prop. acquisitions. 14. Before royalty. 15. Before taxes. 16. Net of government incentives. 17. Crude oil, natural gas,

Worldwide oil production Mill bbl		Worldwide natural gas production Bcf		Worldwide oil reserves Mill bbl		Worldwide natural gas reserves Bcf	
1988	1987	1988	1987	1988	1987	1988	1987
121.7	106.3	229.5	208.3	[22]3.4	[22]3.4	[22]5,014.0	[22]4,660.9
29.5	29.1	13.2	14.4	[23]775.0	[23]621.0	[23]500.0	[23]1,200.0
NA	24.7	NA	66.9	NA	NA	NA	NA
95.3	126.1	617.9	568.5	[24]4,573.9	[24]4,060.8	[24]0.0	[24]0.0
[25]645.3	[25]644.6	2,193.4	2,386.4	8,839.0	8,419.0	38,687.0	39,085.0
[1]14.1	[1]8.8	[1]208.9	[1]136.8	508.0	545.8	5,619.9	5,984.3
[26]6.5	[26]5.8	[26]7.4	[26]7.1	NA	NA	NA	NA
128.3	**124.5**	**98.9**	**102.4**	**1,100.1**	**1,017.1**	**1,638.4**	**1,038.1**
48.4	**42.6**	**25.4**	**20.5**	**381.0**	**378.0**	**296.0**	**318.0**
0.1	**0.2**	**0.0**	**0.0**	**54.0**	**30.0**	**1.2**	**0.0**
10.3	**10.4**	**3.5**	**10.5**	**NA**	**NA**	**NA**	**NA**
567.3	**520.1**	**397.1**	**304.8**	**[29]5,224.0**	**[29]5,005.0**	**[29]11,813.0**	**[29]18,575.0**
4.8	**4.2**	**4.6**	**0.3**	**116.0**	**89.9**	**334.9**	**157.6**
17.8	**14.5**	**8.1**	**7.7**	**215.2**	**160.4**	**0.3**	**0.3**
228.4	230.7	1,542.4	1,471.6	8,400.0	8,500.0	104,200.0	105,900.0
1.6	1.9	NA	NA	NA	NA	NA	NA
325.6	345.3	NA	NA	NA	NA	NA	NA
0.1	0.1	2.9	2.6	NA	NA	NA	NA
340.4	311.3	NA	NA	NA	NA	NA	NA
378.6	**395.4**	**461.9**	**445.3**	**92,205.0**	**92,205.0**	**183,500.0**	**183,500.0**
15.7	**14.3**	**184.9**	**175.8**	**126.0**	**141.0**	**6,700.0**	**6,900.0**
132.8	**137.8**	**95.2**	**91.8**	**4,000.0**	**4,000.0**	**5,015.0**	**6,000.0**
819.8	**843.2**	**620.0**	**670.7**	**92,850.0**	**92,850.0**	**494,400.0**	**489,400.0**
983.8	**792.1**	**110.4**	**59.9**	**100,000.0**	**100,000.0**	**95,000.0**	**26,300.0**
NA	NA	NA	NA	NA	NA	NA	NA
439.2	370.8	174.6	156.1	91,920.0	91,920.0	42,500.0	36,400.0
221.4	212.4	73.2	62.4	4,071.0	4,012.0	9,320.0	9,500.0
126.6	106.9	204.2	164.4	3,150.0	3,150.0	156,700.0	156,700.0
1,803.7	1,456.7	899.3	740.9	169,970.0	166,980.0	145,848.0	139,900.0
NA	61.4	NA	NA	1,730.0	1,750.0	13,130.0	1,500.0
82.1	**82.7**	**155.9**	**131.1**	**675.0**	**646.0**	**5,607.0**	**5,183.0**
1.9	**1.2**	**12.3**	**11.0**	**31.6**	**16.5**	**271.7**	**164.4**
1.1	**1.2**	**13.6**	**13.5**	**5.4**	**4.1**	**123.0**	**134.6**
[1]0.2	**[1]0.2**	**6.7**	**6.7**	**NA**	**NA**	**NA**	**NA**
0.3	**0.4**	**5.2**	**1.9**	**NA**	**NA**	**NA**	**NA**
NA	NA	NA	NA	NA	NA	NA	NA
0.6	0.5	3.1	3.1	2.3	2.8	55.3	58.4
11.0	11.2	96.4	96.6	0.1	76.8	2,186.8	1,940.1
5.5	6.9	32.0	31.7	54.0	58.0	9,460.0	9,460.0
232.0	222.3	312.3	269.1	6,354.0	4,250.0	22,861.0	17,550.0
218.3	221.6	NA	NA	NA	NA	NA	NA
NA	1.6	NA	NA	NA	NA	NA	NA
NA	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**
191.1	**174.8**	**590.7**	**568.3**	**2,900.0**	**2,900.0**	**52.0**	**52.0**
0.0	**0.0**	**0.0**	**0.0**	**10.0**	**10.0**	**150.0**	**150.0**
NA	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**
NA	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**
1.2	**0.9**	**40.0**	**43.2**	**NA**	**NA**	**NA**	**NA**

and other income only. 18. Changed fiscal yearend—contains 15 months. 19. As of fiscal yearend, Texaco Canada was purchased by Imperial Oil Ltd. 20. Net operating revenues. 21. Net sales. 22. Proved, developed, and undeveloped. 23. Based on working interest. 24. Oil and natural gas. 25. Net equity production. 26. Fields on stream only. 27. Changed fiscal yearend--contains 11 months only. 28. Excludes non-operating income. 29. Developed and undeveloped. 30. Total assets minus current liabilities. 31. Fiscal yearend is June 30.

The OGJ400 Company Index

Rank by total assets	Company name	Headquarters city
217	**Adams Resources & Energy Inc.**	Houston
71	**Adobe Resources Corp.**	New York
153	**Alamco, Inc.**	Clarksburg, W.Va.
332	**Albion International Resources, Inc.**	Laguna Beach, Calif.
178	**Alexander Energy Corp.**	Oklahoma City
95	**Allegheny & Western Energy Corp.**	Charleston, W.Va.
281	**Alta Energy Corp.**	Midland
299	**Altex Industries, Inc.**	Denver
381	**Amacan Resources Corp.**	Salt Lake City
91	**AMAX Oil & Gas Inc.**	Houston
397	**Amber Resources Co.**	Denver
17	**Amerada Hess Corp.**	New York
85	**American Exploration Co.**	Houston
143	**American National Petroleum Co.**	Houston
30	**American Petrofina Inc.**	Dallas
4	**Amoco Corp.**	Chicago
40	**Anadarko Petroleum Corp.**	Houston
59	**Apache Corp.**	Denver
145	**Apache Offshore Investment Partnership**	Denver
333	**Appalachian Oil & Gas Co., Inc.**	Chattanooga, Tenn.
231	**Arch Petroleum Inc.**	Fort Worth
8	**ARCO (Atlantic Richfield Corp.)**	Los Angeles
24	**Arkla, Inc.**	Shreveport
19	**Ashland Oil Inc.**	Ashland, Ky.
323	**Aspen Exploration Corp.**	Denver
105	**Avalon Corp.**	New York
195	**Barrett Resources Corp.**	Denver
200	**Baruch-Foster Corp.**	Dallas
279	**Basic Earth Science Systems, Inc.**	Englewood, Colo.
146	**Beard Oil Co.**	Oklahoma City
203	**Belcor Inc.**	Irvine, Calif.
190	**Belden & Blake Energy Co.**	North Canton, Ohio
238	**Bellwether Exploration Co.**	Houston
124	**Berry Petroleum Co.**	Taft, Calif.
44	**BHP Petroleum (Americas) Inc.**	Houston
350	**Big Piney Oil & Gas Co.**	Salt Lake City
398	**Black Dome Energy Corp.**	Evergreen, Colo.
336	**Bogert 1985 - II LP**	Oklahoma City
382	**Bogert 1985 - III LP**	Oklahoma City
376	**Bogert 1985 - IV LP**	Oklahoma City
147	**Bogert Oil Co.**	Oklahoma City
379	**Bolyard Oil & Gas Ltd.**	Denver
7	**BP America**	Cleveland
101	**Bridge Oil (U.S.A.) Inc.**	Dallas
215	**Brock Exploration Corp.**	New Orleans
327	**Broken Arrow Petroleum Co.**	Scottsdale, Ariz.
120	**Buttes Gas & Oil Co.**	Houston
38	**Cabot Corp.**	Waltham, Mass.
348	**Calcasieu Real Estate & Oil Co. Inc.**	Lake Charles, La.
168	**Callon Consolidated Partners L.P.**	Natchez, Miss.
131	**Calumet Industries Inc.**	Chicago
391	**Caplan Corp.**	Brenham, Tex.
212	**Caspen Oil Inc.**	Dallas
232	**Castle Energy Corp.**	Blue Bell, Pa.
62	**Cenex, Farmer's Union Central Exchange, Inc.**	St. Paul, Minn.
318	**Chaparral Resources Inc.**	Denver
165	**Chapman Energy Inc.**	Dallas
3	**Chevron Corp.**	San Francisco
292	**Churchill Technology, Inc.**	Lakewood, Colo.
394	**Circle Seven Oil & Gas Inc.**	Jacksboro, Tex.
151	**Clinton Gas Systems, Inc.**	Columbus, Ohio
15	**Coastal Corp.**	Houston
338	**Coastal Strategies Income Fund A**	San Jose, Calif.
331	**Coastal Strategies Income Fund B**	San Jose, Calif.
367	**Coastal Strategies Income Fund C**	San Jose, Calif.
234	**Cobb Resources Corp.**	Albuquerque
157	**Coho Resources Inc.**	Calgary, Alta., Can.
16	**Columbia Gas System Inc.**	Wilmington, Del.
228	**Columbian Energy Co. L.P.**	Topeka, Kan.
197	**Columbus Energy Corp.**	Denver
170	**Comstock Resources, Inc.**	Dallas
280	**COM-TEK Resources Inc.**	Denver
12	**Conoco Inc.**	Houston
103	**Conquest Exploration Co.**	Houston
196	**Consolidated Energy Partners L.P.**	Denver
20	**Consolidated Natural Gas Co.**	Pittsburgh
186	**ConVest Energy Partners Ltd.**	Houston
251	**Credo Petroleum Corp.**	Denver
321	**Crescent Oil & Gas Corp.**	Denver
396	**Croff Oil Co.**	Denver
114	**Crystal Oil Co.**	Shreveport
230	**Daleco Resources Corp.**	Los Angeles
303	**Dallas Oil & Minerals Inc.**	Fort Worth
97	**Damson Energy Co. L.P.**	New York
110	**Damson Oil Corp.**	New York
73	**DEKALB Energy Co.**	Denver
187	**Deminex U.S. Oil Co.**	Dallas
112	**Devon Energy Corp.**	Oklahoma City
183	**DI Industries, Inc.**	Houston
86	**Diamond Shamrock Offshore Partners L.P.**	Dallas
56	**Diversified Energies, Inc.**	Minneapolis
361	**DOL Resources, Inc.**	Dallas
222	**Dorchester Hugoton, Ltd.**	Dallas
341	**Double Eagle Petroleum and Mining Co.**	Casper, Wyo.
374	**Eagle Exploration Co.**	Denver
266	**Eglinton Oil & Gas Corp.**	Fort Worth
375	**EMC Energies, Inc.**	Casper, Wyo.
295	**Energetics, Inc.**	Englewood, Colo.
224	**Energy Assets International Corp.**	Houston
289	**Energy Sources Inc.**	Lubbock, Tex.
169	**Enex Resources Corp.**	Kingwood, Tex.
14	**Enron Corp.**	Houston
28	**Enserch Corp.**	Dallas
50	**Enserch Exploration Partners Ltd.**	Dallas
106	**Ensource Inc.**	Houston
46	**Equitable Resources Inc.**	Pittsburgh
132	**Equity Oil Co.**	Salt Lake City
138	**Ethyl Corp.(Oil & Gas Division)**	Baton Rouge, La.
243	**Evergreen Resources Inc.**	Denver
353	**Exploration Co.**	San Antonio
118	**Exploration Co. of Louisiana, Inc.**	Lafayette, La.
1	**Exxon Corp.**	New York
242	**Falcon Oil & Gas Co., Inc.**	Odessa, Tex.
194	**Federated Natural Resources Corp.**	Traverse City, Mich.
167	**Fidelity Oil Group**	Bismark, N.D.
81	**First Mississippi Corp.**	Jackson, Miss.
69	**Forest Oil Corp.**	Denver
42	**Freeport McMoRan Energy Partners**	New Orleans
22	**Freeport-McMoRan Inc.**	New Orleans
152	**Freeport-McMoRan Oil and Gas Royalty Trust**	Houston
141	**Fuel Resources Development Co.(FUELCO)**	Denver
129	**Fuel Resources Inc.**	Staten Island, N.Y.
206	**Garnet Resources Corp.**	Houston
156	**General Energy Development Ltd.**	Houston
351	**General Energy Resources & Technology Corp.**	Traverse City, Mich.
192	**Geodyne Resources, Inc.**	Tulsa
271	**GeoResources Inc.**	Williston, N.D.
60	**Global Marine Inc.**	Houston
99	**Global Natural Resources Inc.**	Houston
286	**Gold King Consolidated Inc.**	Denver
284	**Golden Oil Co.**	Tulsa
344	**Golden Triangle Royalty & Oil, Inc.**	Cisco, Tex.
53	**Grace Natural Resources Group**	Dallas
314	**Great Eastern Energy & Development Corp.**	Englewood, Colo.
302	**Greenwood Holdings Inc.**	Englewood, Colo.
225	**Gulf Exploration Consultants Inc.**	Houston
67	**Hadson Corp.**	Oklahoma City
358	**Hailey Energy Corp.**	Abilene, Tex.
55	**Hamilton Oil Corp.**	Denver
290	**HarCor Energy Inc.**	Beverly Hills, Calif.
94	**Harken Energy Corp.**	Bedford, Tex.
296	**Hawks Industries Inc.**	Casper, Wyo.
65	**Helmerich & Payne, Inc.**	Tulsa
201	**Hershey Oil Corp.**	Pasadena, Calif.
393	**Hipoint Investments, Ltd.**	Oklahoma City
93	**Home Petroleum Corp.**	Denver
252	**Home-Stake Oil & Gas Co.**	Tulsa
229	**Home-Stake Royalty Corp.**	Tulsa
283	**Houston Oil Royalty Trust**	Houston
155	**Houston Oil Trust**	Houston
104	**Howell Corp.**	Houston
357	**Hubco Exploration Inc.**	New Orleans
176	**ICG Petroleum Inc.**	Calgary, Alta., Can.
335	**Imperial Petroleum Inc.**	Dallas
113	**Integrated Drilling and Exploration Inc.**	Tulsa
300	**International Basic Resources, Inc.**	Tucson
312	**International Management & Research Corp.**	Philadephia
385	**International Royalty & Oil Co.**	Fort Worth
345	**Intramerican Oil & Minerals Inc.**	Dallas
181	**KCS Group Inc.**	Edison, N.J.
317	**Keldon Oil Co.**	San Clemente, Calif.
213	**Kelley Oil Corp.**	Houston
142	**Kelley Oil & Gas Partners, Ltd.**	Houston
193	**KenCope Energy Companies**	San Antonio
26	**Kerr-McGee Corp.**	Oklahoma City
111	**Key Production Co. Inc.**	Denver
219	**Kimbark Oil & Gas Co.**	Denver
304	**Kimco Energy Corp.**	Arlington, Tex.
311	**K.R.M. Petroleum Corp.**	White Plains, N.Y.
199	**LL & E Royalty Trust**	Houston
267	**Lomak Petroleum Inc.**	Hartville, Ohio
41	**Louisiana Land & Exploration Co.**	New Orleans
383	**Love Oil Co. Inc.**	Denver
360	**Lynx Exploration Co.**	Denver
362	**Lyric Energy Inc.**	Amarillo
277	**Magic Circle Energy Corp.**	Oklahoma City
36	**Maxus Energy Corp.**	Dallas
162	**Maynard Oil Co.**	Dallas
161	**McFarland Energy Inc.**	Santa Fe Springs, Calif.
29	**Meridian Oil Inc.**	Houston
27	**Mesa L.P.**	Amarillo
390	**Mexco Energy Corp.**	Midland
137	**MGF Oil Corp.**	Midland
370	**Minex Resources Inc.**	Riverton, Wyo.
172	**Mission Resource Partners, L.P.**	Alameda, Calif.
33	**Mitchell Energy & Development Corp.**	The Woodlands, Tex.
2	**Mobil Corp.**	New York
316	**Monogram Oil & Gas Inc.**	North Canton, Ohio
34	**Montana Power Co.**	Butte, Mont.

The OGJ400 Company Index continued

Rank by total assets	Company name	Headquarters city
365	**Morrison Nuclear Inc**	Calgary, Alta., Can.
182	**MSR Exploration Ltd.**	Cut Bank, Mont.
32	**Murphy Oil Corp.**	El Dorado, Ark.
273	**Mustang Companies, Inc**	Great Bend, Kan.
189	**Mustang Resources Corp.**	Houston
233	**Nahama & Weagant Energy Co.**	Bakersfield, Calif.
84	**National Cooperative Refinery Association**	McPherson, Kan.
43	**National Fuel Gas Co.**	New York
74	**NERCO Oil & Gas, Inc**	Vancouver, Wash.
31	**NICOR Inc.**	Naperville, Ill.
68	**Noble Affiliates, Inc.**	Ardmore, Okla.
98	**Noble Drilling Corp.**	Houston
89	**Norcen Energy Resources Ltd. (US Operations)**	Calgary, Alta. Can.
265	**Normandy Oil and Gas Co. Inc**	Fort Worth
92	**Northern Michigan Exploration Co.**	Jackson, Mich.
346	**Nova Natural Resources Corp.**	Salt Lake City
75	**NRM Energy Company, L.P**	Dallas
218	**Nucorp, Inc.**	Chicago
257	**Nugget Oil Corp.**	Bloomington, Minn.
268	**NY Life Oil&Gas Producing Properties II-A,L.P.**	Houston
256	**NY Life Oil&Gas Producing Properties II-B,L.P.**	Houston
308	**NY Life Oil&Gas Producing Properties II-C,L.P.**	Houston
214	**NY Life Oil&Gas Producing Properties II-D,L.P.**	Houston
297	**NY Life Oil&Gas Producing Properties I-A,Ltd.**	Houston
320	**NY Life Oil&Gas Producing Properties I-B,Ltd.**	Houston
272	**NY Life Oil&Gas Producing Properties I-C,Ltd.**	Houston
305	**NY Life Oil&Gas Producing Properties I-D,Ltd.**	Houston
9	**Occidental Petroleum Corp.**	Los Angeles
48	**Ocean Drilling & Exploration Co.**	New Orleans
384	**Oil City Petroleum Inc.**	Tulsa
154	**OKC L.P.**	Dallas
258	**Omni Exploration Inc.**	Columbus, Ohio
51	**ONEOK Inc.**	Tulsa
163	**Oregon Natural Gas**	Portland, Ore.
21	**Oryx Energy Co.**	Dallas
329	**Oxford Consolidated Inc.**	Denver
45	**Pacific Enterprises Oil & Gas Co.**	Los Angeles
159	**Paine Webber/Geodyne Energy Income L.P. II-A**	Tulsa
177	**Paine Webber/Geodyne Energy Income L.P. II-B**	Tulsa
220	**Paine Webber/Geodyne Energy Income L.P. II-C**	Tulsa
175	**Paine Webber/Geodyne Energy Income L.P. II-D**	Tulsa
198	**Paine Webber/Geodyne Energy Income L.P. II-E**	Tulsa
328	**Paine Webber/Geodyne Energy Income L.P. I-A**	Tulsa
278	**Paine Webber/Geodyne Energy Income L.P. I-B**	Tulsa
312	**Paine Webber/Geodyne Energy Income L.P. I-C**	Tulsa
287	**Paine Webber/Geodyne Energy Income L.P. I-D**	Tulsa
174	**Paine Webber/Geodyne Energy Income L.P. I-E**	Tulsa
237	**Paine Webber/Geodyne Energy Income L.P. I-F**	Tulsa
400	**Pan Energy Resources, Inc.**	Honolulu, Ha.
208	**Pan Petroleum MLP**	Kansas City, Mo
260	**Panhandle Royalty Co.**	Oklahoma City
334	**Pantepec International, Inc.**	Woodbridge, Conn.
307	**Parallel Petroleum Corp.**	Midland
100	**Parker & Parsley Development Partners L.P.**	Midland
269	**Partners Oil Co.**	Houston
116	**Patrick Petroleum Co.**	Jackson, Mich.
87	**Pauley Petroleum, Inc.**	Roswell, N.M.
76	**Pelto Oil Co.**	Houston
160	**Pend Oreille Oil & Gas Co.**	Houston
150	**Penn Virginia Resources Corp.**	Duffield, Va.
18	**Pennzoil Co.**	Houston
337	**Penn-Pacific Corp.**	Dallas
249	**Permian Basin Royalty Trust**	Fort Worth
342	**Petrol Industries, Inc.**	Shreveport
184	**Petroleum Development Corp.**	Bridgeport, W.Va.
211	**Petroleum Investments, Ltd.**	Oklahoma City
246	**Petrominerals Corp.**	Tustin, Calif.
388	**Petrotech, Inc.**	Denver
10	**Phillips Petroleum Co.**	Bartlesville, Okla.
288	**Pinnacle Petroleum Inc.**	Houston
319	**Pioneer Oil & Gas**	Midvale, Utah
135	**Plains Petroleum Co.**	Lakewood, Colo.
122	**Plains Resources Inc.**	Oklahoma City
347	**Plano Petroleum Corp.**	Plano, Tex.
270	**Plexus Resources Corp.**	Salt Lake City
72	**Pogo Producing**	Houston
239	**Premier Resources Ltd.**	Denver
79	**Presidio Oil Co.**	Englewood, Colo.
263	**Prima Energy Corp.**	Denver
127	**Production Operators Corp.**	Houston
140	**Prudential-Bache Energy Growth Fund, L.P. G-1**	Covington, La.
275	**Prudential-Bache Energy Income Fund 1983P-1**	Covington, La.
262	**Prudential-Bache Energy Income Fund 1983P-2**	Covington, La.
250	**Prudential-Bache Energy Income Fund 1983P-3**	Covington, La.
126	**Prudential-Bache Energy Income LP VP-18**	Covington, La.
115	**Prudential-Bache Energy Income LP VP-19**	Covington, La.
130	**Prudential-Bache Energy Income LP VP-20**	Covington, La.
119	**Prudential-Bache Energy Income LP VP-21**	Covington, La.
125	**Prudential-Bache Energy Income LP VP-22**	Covington, La.
191	**Prudential-Bache Energy Income L.P. II P-10**	Covington, La.
202	**Prudential-Bache Energy Income L.P. II P-11**	Covington, La.
236	**Prudential-Bache Energy Income L.P. II P-4**	Covington, La.
240	**Prudential-Bache Energy Income L.P. II P-5**	Covington, La.
245	**Prudential-Bache Energy Income L.P. II P-6**	Covington, La.
235	**Prudential-Bache Energy Income L.P. II P-7**	Covington, La.
188	**Prudential-Bache Energy Income L.P. II P-8**	Covington, La.
216	**Prudential-Bache Energy Income L.P. II P-9**	Covington, La.
148	**Prudential-Bache Energy Income L.P. III P-12**	Covington, La.
164	**Prudential-Bache Energy Income L.P. III P-13**	Covington, La.
136	**Prudential-Bache Energy Income L.P. III P-14**	Covington, La.
149	**Prudential-Bache Energy Income L.P. III P-15**	Covington, La.
121	**Prudential-Bache Energy Income L.P. IV P-16**	Covington, La.
117	**Prudential-Bache Energy Income L.P. IV P-17**	Covington, La.
326	**Prudential-Bache Pension & Retirement LP PBR-1**	Covington, La.
301	**Prudential-Bache Pension & RetirementLP PBR-2**	Covington, La.
247	**Prudential-Bache Pension & Retirement LP PBR-3**	Covington, La.
264	**Prudential-Bache Pension & Retirement LP PBR-4**	Covington, La.
207	**Prudential-Bache Pension & Int'l Investor LPPI-1**	Covington, La.
227	**Prudential-Bache Pension&Int'l InvestorLP PI-2**	Covington, La.
274	**Pyramid Oil Co.**	Bakersfield, Calif.
282	**Q E D Exploration, Inc.**	Denver
58	**Quaker State Corp.**	Oil City, Pa.
306	**Questa Oil & Gas Co**	Littleton, Colo.
47	**Questar Corp**	Salt Lake City
88	**Quinoco Companies**	Denver
80	**Ram Industries, Inc.**	Dallas
241	**Ranger Oil Ltd.**	Calgary, Alta., Can.
354	**Ratex Resources Inc.**	Oklahoma City
63	**Reading & Bates Corp.**	Houston
209	**Red Eagle Resources Corp.**	Oklahoma City
378	**Republic Resources Corp.**	Oklahoma City
359	**Reserve Exploration Co.**	Tulsa
205	**Resource Exploration Inc.**	Akron, Ohio
349	**Roberts Oil and Gas Inc**	Houston
324	**Robson Petroleum Ltd.**	Tulsa
399	**Rockwell Drilling Co.**	Holdenville, Okla.
343	**Roseland Oil & Gas, Inc.**	Tyler, Tex.
395	**Rotan Mosle Energy Fund III, Ltd.**	Houston
325	**Roxana Resources, Ltd.**	Tulsa
223	**Sabine Royalty Trust**	Dallas
254	**Sage Drilling Co., Inc.**	Wichita, Kan.
108	**Sage Energy Co.**	San Antonio
133	**Samson Energy Co. L.P.**	Tulsa
109	**San Juan Basin Royalty Trust**	Fort Worth
49	**Santa Fe Energy Co.**	Houston
77	**Santa Fe Energy Partners, L.P.**	Houston
166	**Saxon Oil Co.**	Dallas
185	**Saxon Oil Development Partners L.P.**	Dallas
83	**Seagull Energy Corp.**	Houston
259	**Seahawk Oil International, Inc.**	Irvine, Calif.
322	**Senergy 1986 Ltd.**	Houston
352	**Sharon Energy Ltd.**	Englewood, Colo.
330	**Sheffield Exploration Co. Inc.**	Denver
5	**Shell Oil Co.**	Houston
96	**Snyder Oil Partners L.P.**	Fort Worth
25	**Sonat Inc.**	Birmingham, Ala.
387	**Sooner Energy Corp.**	Oklahoma City
364	**South Texas Drilling & Exploration, Inc.**	San Antonio
291	**Southern Mineral Corp.**	Houston
78	**Southern Union Co.**	Dallas
82	**Southwestern Energy Co.**	Fayetteville, Ark.

The OGJ400 Company Index continued

Rank by total assets	Company name	Headquarters city
380	**Standard Oil & Exploration of Delaware Inc.**	Sarasota, Fla.
371	**Stellar Petroleum Inc.**	Dallas
293	**Strata Corp.**	Cleveland
244	**Striker Petroleum Corp.**	Englewood, Colo.
366	**Struthers Oil & Gas Corp.**	Tulsa
210	**Sunlite Inc.**	Atlanta
61	**Sunshine Mining Co.**	Dallas
171	**Swift Energy Co.**	Houston
315	**Tatum Petroleum Corp.**	Downey, Calif.
180	**Taurus Exploration, Inc.**	Birmingham, Ala.
340	**Taurus Petroleum Inc.**	Denver
70	**Tesoro Petroleum Corp.**	San Antonio
6	**Texaco Inc.**	White Planins, N.Y.
158	**Texas International Co.**	Oklahoma City
173	**Texas Meridian Resources Ltd.**	Houston
369	**Texas Vanguard Oil Co.**	Austin
90	**TGX Corp.**	Houston
134	**Thermal Exploration Co.**	Seattle
221	**Thor Energy Resources Inc.**	Tyler, Tex.
179	**Tipperary Corp.**	Midland
368	**Toklan Oil Corp.**	Tulsa
123	**Tom Brown Inc.**	Midland
309	**Toreador Royalty Corp.**	Dallas
52	**Total Minatome Corp.**	Houston
386	**TPEX Exploration Inc.**	Denver
23	**Transco Energy Co.**	Houston
54	**Transco Exploration Partners**	Houston
255	**Trinity Resources Ltd.**	Houston
64	**Triton Energy Corp.**	Dallas
392	**Triumph Oil & Gas Corp.**	New York
363	**Tri-Valley Corp.**	Bakersfield, Calif.
204	**Tucker Drilling Co. Inc.**	San Angelo, Tex.
373	**Twin Richfield Oils, Inc.**	Calgary, Alta., Can.
310	**Tyrex Oil Co.**	Casper, Wyo.
66	**Unimar Co.**	Tarrytown, N.Y.
39	**Union Exploration Partners Ltd.**	Houston
35	**Union Pacific Resources Co.**	Fort Worth
37	**Union Texas Petroleum Holdings, Inc.**	Houston
128	**Unit Corp.**	Tulsa
13	**Unocal Corp.**	Los Angeles
11	**USX (Oil & Gas segment)**	Pittsburg
285	**U.S. Energy Search Inc.**	San Antonio
261	**U.S. Mineral & Royalty Corp.**	Atlanta
339	**Valex Petroleum Inc.**	Fort Worth
226	**Vermilion Bay Land Co.**	Layfayette, La.
313	**Vineyard Oil & Gas Co.**	North East, Pa.
102	**Wainoco Oil Corp.**	Houston
356	**Western Energy Resources Inc.**	Laguna Niguel, Calif.
294	**WEXCO of Delaware, Inc.**	Milwaukee, Wis.
253	**Whiting Petroleum Corp.**	Denver
276	**Wichita River Oil Corp.**	Denver
355	**Willard Pease Oil & Gas Co.**	Grand Junction, Colo.
144	**Wilshire Oil Co. of Texas**	Jersey City, N.J.
107	**Wiser Oil Co.**	Sistersville, W.Va.
139	**Wolverine Exploration Co.**	Fort Worth
298	**Woodbine Petroleum Inc.**	Dallas
377	**Wyoming Oil & Minerals, Inc.**	Casper, Wyo.
389	**Yellowstone Resources, Inc.**	Denver
57	**Zapata Corp.**	Houston
248	**Z G Energy Corp.**	Tulsa

CRUDE OIL ASSAYS

Key to the assays . . .

Each assay is headed, in the following order, by the official name of the crude, the former or secondary name in parenthesis, the country of origin, and location and type loading facilities. Loading systems that frequently crop up are abbreviated. Those used are CBM (conventional buoy mooring), SPM (single point mooring), SBM (single buoy mooring), CALM (catenary anchor leg mooring), and SALM (single anchor leg mooring).

Mideast

Aboozar (Ardeshir), Iran

Terminal Kharg Island

Crude
Gravity, °API: 26.9
Sulfur, wt %: 2.48
Rvp, psi: 5.5
H_2S (dissolved) wt %: 0.031
H_2S (evolved) wt %: 0.089
Pour pt, °F.: −30
Salt, lb/1,000 bbl: 55.0
Neutralization value, mg KOH/g: 1.96
Rams. carbon, wt %: 5.9
Kin. vis., cSt @ 68° F.: 36.58
@ 122° F.: 12.76
V/Ni, ppm: 71/21
Light hydrocarbons, vol %: 3.86

Naphtha
Range (TBP), °F.: C_5-200
Yield, vol %: 5.5
Gravity, °API: 80.2
Sulfur (total) wt %: 0.090
Mercaptan S, wt %: 0.044
Rvp, psi: 10.3
Paraffins, vol %: 72.6
Naphthenes, vol %: 24.2
Aromatics, vol %: 3.1
RON, clear: 71.7
MON, clear: 67.9

Naphtha
Range (TBP), °F.: 200-320
Yield, vol %: 8.4
Gravity, °API: 55.7
Sulfur (total) wt %: 0.097
Mercaptan S, wt %: 0.027
Rvp, psi: 1.0
P/N/A, vol %: 60.1/27.3/12.7
RON, clear: 45.7
MON, clear: 44.3

Naphtha
Range (TBP), °F.: 320-360
Yield, vol %: 3.8
Gravity, °API: 48.6
Sulfur (total), wt %: 0.158
Mercaptan S, wt %: 0.023
P/N/A, vol %: 59.1/25.8/15.1
RON, clear: 30.2
MON, clear: 31.4

Kerosine
Range (TBP), °F.: 360-520
Yield, vol %: 14.4
Gravity, °API: 41.9
Sulfur (total), wt %: 0.452
Mercaptan S, wt %: 0.015
Aniline pt, °F.: 143.9
Diesel index: 60.2
Cetane index: 49.3
Freeze pt, °F.: −32
Cloud pt, °F.: −49
Pour pt, °F.: −52
Smoke pt, mm: 20

Gas oil
Range (TBP), °F.: 520-650
Yield, vol %: 12.7
Gravity, °API: 33.4
Sulfur (total), wt %: 1.274
Charac. factor: 11.74
Aniline pt, °F.: 158.8
Diesel index: 53.0
Cetane index: 52.7
Cloud pt, °F.: 21
Pour pt, °F.: 18
Vis., SUS @ 100° F.: 40.4
@ 122° F.: 37.1

Residuum
Range (TBP), °F.: 650+
Yield, vol %: 53.5
Gravity, °API: 12.5
Sulfur (total), wt %: 3.804
Pour pt, °F.: 56
Rams. carbon, wt %: 10.0
Vis., SUS @ 122° F.: 12,303.9
@ 210° F.: 465.9
V/Ni, ppm: 120/36

Residuum
Range (TBP), °F.: 1,050+
Yield, vol %: 24.2
Gravity, °API: 3.5
Sulfur (total), wt %: 5.069
Pour pt, °F.: 210
Rams. carbon, wt %: 19.6
Vis., SUS @ 210° F.: 125,012.7
V/Ni, ppm: 244/74

Abu Al Bu Khoosh, Abu Dhabi, U.A.E.

Storage tanker offshore producing area

Crude
Gravity, °API: 31.6
Sulfur, wt %: 2.0
Pour pt, °C.: −12 (−24.5° F.)
Kin. vis., 37.8° C. cSt: 6.7
Con. carbon, wt %: 4.3
Rvp, psi: 3.5
V/Ni, ppm: 12/7
Ibp-15° C. yield, wt %: 0.59
vol %: 0.69

Light naphtha
Range, °C.: 15-65
Yield, wt %: 2.74
vol %: 3.59
Gravity, °API: 88.7
Sulfur, wt %: 0.03
Mercaptans, ppm: 325
Paraffins, vol %: 95
Naphthenes, vol %: 4.4
Aromatics, vol %: 0.06
RON, clear: 74
RON + 3 ml TEL: 94.5

Heavy naphtha
Range, °C.: 65-165
Yield, wt %: 14.45
vol %: 16.83
Gravity, °API: 59.6
Sulfur, wt %: 0.05
Mercaptans, ppm: 276
P/N/A, vol %: 68.3/18.5/13.2

Kerosine
Range, °C.: 165-230
Yield, wt %: 11.52
vol %: 12.53
Gravity, °API: 46.25
Sulfur, wt %: 0.16
Mercaptans, ppm: 182
P/N/A, vol %: 55.5/21.8/22.7
Freezing pt, °C.: −52.5
Aniline pt, °C.: 56.4
Diesel index: 61.7
Smoke pt, mm: 23

Light gas oil
Range, °C.: 230-300
Yield, wt %: 12.5
vol %: 12.96
Gravity, °API: 37.6
Sulfur, wt %: 0.85
Pour pt, °C.: −27
Cloud pt, °C.: −19
Aniline pt, °C.: 65
Diesel index: 55.9
Kin. vis., cSt @ 37.8° C.: 2.63

Heavy gas oil
Range, °C.: 300-375
Yield, wt %: 13.83
vol %: 12.71
Gravity, °API: 30.3
Sulfur, wt %: 1.9
Pour pt, °C.: +2
Cloud pt, °C.: +7
Aniline pt, °C.: 72.2
Diesel index: 49.1
Kin. vis., cSt @ 37.8° C.: 6.92

Distillate
Range, °C.: 375-550
Yield, wt %: 26.63
vol %: 24.95
Gravity, °API: 21.4

Sulfur, wt %: 2.67
Pour pt, °C: +26
Cloud pt, °C: +28
Con. carbon, wt %: 0.7
Kin. vis., cSt @ 50° C: 40.96
  @ 98.9° C: 7.89

Residue
Range, °C: 375+
Yield, wt %: 45.37
  vol %: 40.69
Gravity, °API: 14.9
Sulfur, wt %: 3.4
Pour pt, °C: +21
Asphaltenes, wt %: 3.1
V/Ni, ppm: 30/14
Kin. vis., cSt @ 50° C: 435
  @ 98.9° C: 40.3

Residue
Range, °C: 550+
Yield, wt %: 18.7
  vol %: 15.7
Gravity, °API: 4.3
Sulfur, wt %: 4.4
Pour pt, °C: +50
Asphaltenes, wt %: 9.2
V/Ni, ppm: 67/35
Kin. vis., cSt @ 98.9° C: 1,860
Pen. at 25° C: 125

Arabian Heavy (Safaniya), Saudi Arabia

Ras Tanura

Crude
Gravity, °API: 27.9
Sulfur, wt %: 2.85
Pour pt, °F: −20
Rvp, psi: 7.5
Kin. vis., cSt @ 70° F: 37.0
  @ 100° F: 19.0

Light naphtha
Range, °FVT: 68-212
Yield, vol %: 7.9
Gravity, °API: 79.9
Sulfur, wt %: 0.0059
Rvp, psi: 8.5
Paraffins, vol %: 88.6
Naphthenes, vol %: 10.2
Aromatics, vol %: 1.2
RON, clear: 58.0

Heavy naphtha
Range, °FVT: 212-302
Yield, vol %: 6.8
Gravity, °API: 60.5
Sulfur, wt %: 0.016
P/N/A, vol %: 70.8/19.5/9.7

Kerosine
Range, °FVT: 302-455
Yield, vol %: 12.4
Gravity, °API: 48.4
Sulfur, wt % 0.16
Aromatics, vol %: 18.9
Freeze pt °F: −67
Smoke pt, mm: 26
Luminometer no.: 57
Aniline pt, °F: 141
Kin. vis., cSt @ −30° F: 5.14
  @ 100° F: 1.14

Light gas oil
Range, °FVT: 455-650
Yield, vol %: 16.5
Gravity, °API: 35.2
Sulfur, wt %: 1.30
Pour pt, °F: 5
Aniline pt, °F: 154
Kin. vis., cSt @ 100° F: 3.45
  @ 210° F: 1.30

Heavy gas oil
Range, °FVT: 650-1,049
Yield, vol %: 30.6
Gravity, °API: 20.9
Sulfur, wt %: 2.92
Pour pt, °F: 95
Aniline pt, °F: 173
Kin. vis., cSt @ 100° F: 77.0
  @ 210° F: 8.46

Residual oil
Range, °FVT: 650+
Yield, vol %: 53.8
Gravity, °API: 12.6
Sulfur, wt %: 4.34
Pour pt, °F: 60
Con. carbon, wt %: 13.3
Kin. vis., cSt @ 100° F: 4,103
  @ 210° F: 94.2

Residual oil
Range, °FVT: 1,049+
Yield, vol %: 23.2
Gravity, °API: 3.0
Sulfur, wt %: 6.0
Pour pt, °F: 120+
Con. carbon, wt %: 27.7
Kin. vis., cSt @ 210° F: 55,292
  Furol, sec @ 275° F: 1,309
V/Ni/Fe, ppm: 205/64/30

Arabian Light, Saudi Arabia

Ras Tanura and Yanbu also Sidon, Lebanon

Crude
Gravity, °API: 33.4
Sulfur, wt %: 1.79
Pour pt, °F: −30
Rvp, psi: 3.6
Kin. vis., cSt @ 70° F: 10.2
  @ 100° F: 6.25

Light naphtha
Range, °FVT: 68-212
Yield, vol %: 8.9
Gravity, °API: 78.4
Sulfur, wt %: 0.024
Rvp, psi: 8.2
Paraffins, vol %: 86.8
Naphthenes, vol %: 10.7
Aromatics, vol %: 2.5
RON, clear: 55.0

Heavy naphtha
Range, °FVT: 212-302
Yield, vol %: 8.5
Gravity, °API: 59.3
Sulfur, wt %: 0.027
P/N/A, vol %: 68.3/19.0/12.7

Kerosine
Range, °FVT: 302-455
Yield, vol %: 16.5
Gravity, °API: 48.0
Sulfur, wt %: 0.084
Aromatics, vol %: 20.6
Freeze pt, °F: −71
Smoke pt, mm: 23
Luminometer no.: 51
Aniline pt, °F: 138
Kin. vis., cSt @ −30° F: 5.39
  @ 100° F: 1.13

Light gas oil
Range, °FVT: 455-650
Yield, vol %: 19.7
Gravity, °API: 36.5
Sulfur, wt %: 1.03
Pour pt, °F: 5
Aniline pt, °F: 158
Kin. vis., cSt @ 100° F: 3.35
  @ 210° F: 1.30

Heavy gas oil
Range, °FVT: 650-1,049
Yield, vol %: 29.8
Gravity, °API: 22.9
Sulfur, wt %: 2.41
Pour pt, °F: 95
Aniline pt, °F: 180
Kin. vis., cSt @ 100° F: 55.5
  @ 210° F: 6.89

Residual oil
Range, °FVT: 650+
Yield, vol %: 44.6
Gravity, °API: 17.2
Sulfur, wt %: 3.1
Pour pt, °F: 35
Con. carbon, wt %: 7.6
Kin. vis., cSt @ 100° F: 414.3
  @ 210° F: 24.2

Residual oil
Range, °FVT: 1,049+
Yield, vol %: 14.8
Gravity, °API: 6.9
Sulfur, wt %: 4.34
Pour pt, °F: 115
Con. carbon, wt %: 20.3
Kin. vis., cSt @ 210° F: 1,589
  Furol, sec @ 275° F: 104
V/Ni/Fe, ppm: 116/25/114

Arabian Light (Berri), Saudi Arabia

Ras Tanura

Crude
Gravity, °API: 37.8
Sulfur, wt %: 1.19
Pour pt, °F: −25
Rvp, psi: 4.0
Kin. vis., cSt @ 70° F: 5.80
  @ 100° F: 3.86

Light Naphtha
Range, °FVT: 68-212
Yield, vol %: 10.1
Gravity, °API: 78.4
Sulfur, wt %: 0.071
Rvp, psi: 6.9
Paraffins, vol %: 87.4
Naphthenes, vol %: 11.2
Aromatics, vol %: 1.4
RON, clear: 50.0

Heavy naphtha
Range, °FVT: 212-302
Yield, vol %: 8.7
Gravity, °API: 58.2
Sulfur, wt %: 0.053
P/N/A, vol %: 65.3/20.4/14.3

Kerosine
Range, °FVT: 302-455
Yield, vol %: 18.7
Gravity, °API: 48.4
Sulfur, wt %: 0.090
Aromatics, vol %: 19.9
Freeze pt, °F: −71
Smoke pt, mm: 25
Luminometer no.: 54
Aniline pt, °F: 136
Kin. vis., cSt @ −30° F: 4.79
  @ 100° F: 1.10

Light gas oil
Range, °FVT: 455-650
Yield, vol %: 21.2
Gravity, °API: 37.3
Sulfur, wt %: 0.72
Pour pt, °F: 10
Aniline pt, °F: 161
Kin. vis., cSt @ 100° F: 3.4
  @ 210° F: 1.28

Heavy gas oil
Range, °FVT: 650-1,049
Yield, vol %: 30.3
Gravity, °API: 25.1
Sulfur, wt %: 1.83
Pour pt, °F: 95
Aniline pt, °F: 192
Kin. vis., cSt @ 100° F: 44.4
  @ 210° F: 6.25

Residual oil
Range, °FVT: 650+
Yield, vol %: 39.3
Gravity, °API: 21.6
Sulfur, wt %: 2.09
Pour pt, °F.: 70
Con. carbon, wt %: 4.2
Kin. vis., cSt @ 100° F.: 128.1
@ 210° F.: 12.34

Residual oil
Range, °FVT: 1,049+
Yield, vol %: 9.0
Gravity, °API: 11.0
Sulfur, wt %: 2.88
Pour pt, °F.: 80
Con. carbon, wt %: 16.2
Kin. vis., cSt @ 210° F.: 396.9
Furol, sec @ 275° F.: 38.2
V/Ni, ppm: 9/6
Aromatics, ppm: 46

Arabian Medium (Khursaniyah), Saudi Arabia

Ras Tanura

Crude
Gravity, °API: 30.8
Sulfur, wt %: 2.40
Pour pt, °F.: +5
Rvp, psi: 3.2
Kin. vis., cSt @ 70° F.: 16.2
@ 100° F.: 9.41

Light naphtha
Range, °FVT: 68-212
Yield, vol %: 8.9
Gravity, °API: 77.7
Sulfur, wt %: 0.043
Rvp, psi: 7.9
Paraffins, vol %: 85.3
Naphthenes, vol %: 12.3
Aromatics, vol %: 2.4
RON, clear: 54.5

Heavy naphtha
Range, °FVT: 212-302
Yield, vol %: 7.7
Gravity, °API: 59.1
Sulfur, wt %: 0.050
P/N/A, vol %: 68.5/18.8/12.7

Kerosine
Range, °FVT: 302-455
Yield, vol %: 14.5
Gravity, °API: 48.0
Sulfur, wt %: 0.14
Aromatics, vol %: 20.6
Freeze pt, °F.: −62
Smoke pt, mm: 23
Luminometer no.: 52
Aniline pt, °F.: 136
Kin. vis., cSt @ −30° F.: 5.10
@ 100° F.: 1.13

Light gas oil
Range, °FVT: 455-650
Yield, vol %: 18.1
Gravity, °API: 36.0
Sulfur, wt %; 1.24
Pour pt, °F.: 15
Aniline pt, °F.: 157
Kin. vis., cSt @ 100° F.: 3.53
@ 210° F.: 1.32

Heavy gas oil
Range, °FVT: 650-1,049
Yield, vol %: 30.9
Gravity, °API: 21.9
Sulfur, wt %: 2.91
Pour pt, °F.: 100
Aniline pt, °F.: 176
Kin. vis., cSt @ 100° F.: 49.2
@ 210° F.: 6.40

Residual oil
Range, °FVT: 650+
Yield, vol %: 49.6
Gravity, °API: 15.0
Sulfur, wt %: 3.90
Pour pt, °F.: 55
Con. carbon, wt %: 9.9
Kin. vis., cSt @ 100° F.: 850
@ 210° F.: 36.0

Residual oil
Range, °FVT: 1,049+
Yield, vol %: 18.7
Gravity, °API: 4.9
Sulfur, wt %: 5.35
Pour pt, ° F.: 115
Con. carbon, wt %: 23.3
Kin. vis., cSt @ 210° F.: 3,847
Furol, sec @ 275° F.: 226
V/Ni/Fe, ppm: 96/32/30

Arabian Medium (Zuluf/Marjan), Saudi Arabia

Juayma

Crude
Gravity, °API: 31.1
Sulfur, wt %: 2.48
Pour pt, °F.: −20
Rvp, psi: 8.3
Kin. vis., cSt @ 70° F.: 19.4
@ 100° F.: 11.01

Light naphtha
Range, °FVT: 68-212
Yield, vol %: 8.9
Gravity, °API: 79.7
Sulfur, wt %: 0.0069
Rvp, psi: 9.1
Paraffins, vol %: 89.3
Naphthenes, vol %: 9.6
Aromatics, vol %: 1.1
RON, clear: 58.6

Heavy naphtha
Range, °FVT: 212-302
Yield, vol % on crude: 8.2
Gravity, °API: 60.2
Sulfur, wt %: 0.024
P/N/A, vol %: 69.3/20.2/10.5

Kerosine
Range, °FVT: 302-455
Yield, vol %: 14.1
Gravity, °API: 48.3
Sulfur, wt %: 0.14
Aromatics, vol %: 17.2
Freeze pt, °F.: −72
Smoke pt, mm: 26
Luminometer no.: 59
Aniline pt, °F.: 139
Kin. vis., cSt @ −30° F.: 5.01
@ 100° F.: 1.13

Light gas oil
Range, °FVT: 455-650
Yield, vol %: 17.6
Gravity, °API: 36.1
Sulfur, wt %: 1.25
Pour pt, °F.: 10
Aniline pt, °F.: 158
Kin. vis., cSt @ 100° F.: 3.45
@ 210° F.: 1.31

Heavy gas oil
Range, °FVT: 650-1,049
Yield, vol %: 28.2
Gravity, °API: 21.8
Sulfur, wt %: 2.90
Pour pt, °F.: 95
Aniline pt, °F.: 177
Kin. vis., cSt @ 100° F.: 72.6
@ 210° F.: 8.04

Residual oil
Range, °FVT: 650+
Yield, vol %: 48.0
Gravity, °API: 13.9
Sulfur, wt %: 4.06
Pour pt, ° F.: 55
Con. carbon, wt %: 9.4
Kin. vis., cSt @ 100° F.: 2,126
@ 210° F.: 65.9

Residual oil
Range, °FVT: 1,049+
Yield, vol %: 19.8
Gravity, °API: 3.9
Sulfur, wt %: 5.51
Pour pt, ° F.: 140
Con. carbon, wt %: 20.5
Kin. vis., cSt @ 210° F.: 20,085
Furol, sec @ 275° F.: 684
V/Ni/Fe, ppm: 179/54/40

Bahrgansar/Nowruz (SIRIP Blend), Iran

Ras Bahrgan SBM

Crude
Gravity, °API: 27.1
Sulfur, wt %: 2.45
Pour pt, °C.: −33
Vis., cSt @ 100° F.: 20.4
Con. carbon, wt %: 7.9
Rvp, kg/sq cm: 0.56
Salt, lb/1,000 bbl: 30.6
V/Ni, ppm: 72/25

Light naphtha
Range, °C.: C_5-66
Yield, wt %: 3.76
Gravity, °API: 84.3
Sulfur, wt %: 0.065
Rvp, kg/sq cm: 0.87
Paraffins, vol %: 92.3
Naphthenes, vol %: 6.3
Aromatics, vol %: 1.4
RON, clear: 67.4

Heavy naphtha
Range, °C.: 66-150
Yield, wt %: 8.59
Gravity, °API: 59.6
Sulfur, wt %: 0.06
P/N/A, vol %: 60.0/31.0/9.0
RON, clear: 48.0

Kerosine
Range, °C.: 150-250
Yield, wt %: 13.23
Gravity, °API: 46.0
Sulfur, wt %: 0.228
Aromatics, vol %: 18.5
Freezing pt, °C.: < −55
Smoke pt, mm: 22
Aniline pt, °C.: 59.8

Gas oil
Range, °C.: 250-350
Yield, wt %: 14.04
Gravity, °API: 33.6
Sulfur, wt %: 1.19
Pour pt, °C.: −12
Aniline pt, °C.: 69.2
Diesel index: 53.0

Residual oil
Range, °C.: 350+
Yield, wt %: 59.00
Gravity, °API: 11.3
Sulfur, wt %: 3.8
Pour pt, °C.: +12
Con. carbon, wt %: 13.35

Residual oil
Range, °C.: 550+
Yield, wt %: 35.90
Gravity, °API: 4.4
Sulfur, wt %: 4.84
Pour pt, °C.: +48
Con. carbon, wt %: 21.85
V/Ni/Fe, ppm: 202/69/52

Note: Same assay first published in 1976.

Basrah Heavy, Iraq

Mina al Bakr sea terminal in Persian Gulf (Khor al Khafja)

Crude
Gravity, °API: 24.7
Sulfur, wt %: 3.5
Pour pt, °C.: −30
Kin. vis. @ 10° C., cSt: 86.3
C_4 & lighter, wt %: 0.8

Light SR naphtha
Range, °C.: C_5-65
Yield, wt %: 2.6
Density @ 15° C., g/cu m: 0.648
RON + 0.4 g Pb/l: 83

Heavy SR naphtha
Range, °C.: 65-175
Yield, wt %: 12.2
Density @ 15° C., g/cu m: 0.74
RON + 0.4 g Pb/l: 55
Aromatics, vol %: 9.5
Naphthenes, vol %: 21

Kerosine
Range, °C.: 175-222
Yield, wt %: 6.9
Density @ 15° C., g/cu m: 0.799
Sulfur, wt %: 0.38

Gas oil
Range, °C.: 225-360
Yield, wt %: 21.6
Density @ 15° C., g/cu m: 0.871
Sulfur, wt %: 1.95
Pour pt, °C.: −16
Cold filter pour pt, °C.: −14
Kin. vis., cSt @ 100° C.: 1.42

Heavy gas oil
Range, °C.: 360-460
Yield, wt %: 13.5
Density @ 15° C., g/cu m: 0.935
Sulfur, wt %: 3.57
Kin. vis., cSt @ 100° C.: 5.20

Long residuum
Range, °C.: 360+
Yield, wt %: 55.9
Density @ 15° C., g/cu m: 1.012
Sulfur, wt %: 5.25
Kin. vis., cSt @ 100° C.: 178.2

Short residuum
Range, °C.: 460+
Yield, wt %: 42.4
Density @ 15° C., g/cu m: 1.041
Sulfur, wt %: 5.80
Kin. vis., cSt @ 100° C.: 1,350
Con. carbon, wt %: 22.0
V/Ni, ppm: 212/26
Pen. @ 25° C., 0.1 mm: 180

Basrah Light, Iraq

Marine pipeline to Khor-al-Amaya piled structure in gulf

Crude
Gravity, °API: 33.7
Sulfur, wt %: 1.95
Pour pt, °C.: −15
Kin. vis., cSt @ 10° C.: 15.0
C_4 & lighter, wt %: 1.3

Light SR naphtha
Range, °C.: C_5-65
Yield, wt %: 3.7
Density @ 15° C., g/cu m: 0.646
RON + 0.4 g Pb/l: 83

Heavy SR naphtha
Range, °C.: 65-175
Yield, wt %: 16.2
Density @ 15° C., g/cu m: 0.737
RON + 0.4 g Pb/l: 54
Aromatics, vol %: 10
Naphthenes, vol %: 17

Kerosine
Range, °C.: 175-225
Yield, wt %: 8.2
Density @ 15° C., g/cu m: 0.795
Sulfur, wt %: 0.10

Gas oil
Range, °C.: 225-360
Yield, wt %: 22.9
Density @ 15° C., g/ cu m: 0.843
Sulfur, wt %: 1.20
Pour pt, °C.: −12
CFPP, °C.: −9
Kin. vis., cSt @ 100° C.: 1.35

Heavy gas oil
Range, °C.: 360-525
Yield, wt %: 25.1
Density @ 15° C., g/cu m: 0.916
Sulfur, wt %: 2.41
Kin. vis., cSt @ 100° C.: 8.00

Long residuum
Range, °C.: 360+
Yield, wt %: 47.7
Density @ 15° C., g/cu m: 0.966
Sulfur, wt %: 3.60
Kin. vis., cSt @ 100° C.: 38.5

Short residuum
Range, °C.: 525+
Yield, wt %: 22.6
Density @ 15 °C., g/cu m: 1.020
Sulfur, wt %: 4.70
Kin. vis., cSt @ 100 °C.: 760
Con. carbon, wt %: 18.5
V/Ni, ppm: 80/22

Basrah Medium, Iraq

Mina-al-Bakr sea terminal in Persian Gulf (Khor al Khafja)

Crude
Gravity, °API: 31.1
Sulfur, wt %: 2.58
Pour pt, °C.: −30
Kin. vis., cSt @ 10° C.: 41.0
C_4 & lighter, wt %: 1.6

Light SR naphtha
Range, °C.: C_5-65
Yield, wt %: 3.3
Density, 15° C., g/cu m: 0.64
RON + 0.4, g Pb/l: 80

Heavy SR naphtha
Range, °C.: 65-175
Yield, wt %: 14.9
Density @ 15° C., g/cu m: 0.736
RON + 0.4 g Pb/l: 54
Aromatics, vol %: 10.0
Naphthenes, vol %: 17

Kerosine
Range, °C.: 175-225
Yield, wt %: 7.5
Density @ 15° C., g/cu m: 0.793
Sulfur, wt %: 0.23

Gas oil
Range, °C.: 225-360
Yield, wt %: 22.3
Density @ 15° C., g/cu m: 0.849
Sulfur, wt %: 1.57
Pour pt, °C.: −13
CFPP, °C.: −10
Kin. vis., cSt @ 100° C.: 1.44

Heavy gas oil
Range, °C.: 360-520
Yield, wt %: 21.9
Density @ 15° C., g/cu m: 0.931
Sulfur, wt %: 3.08
Kin. vis., cSt @ 100 ° C.: 8.74

Long residuum
Range, °C.: 360+
Yield, wt %: 50.4
Density @ 15° C., g/cu m: 0.984
Sulfur, wt %: 4.38
Kin. vis., cSt @ 100° C.: 61.7

Short residuum
Range, °C.: 520+
Yield, wt %: 28.5
Density @ 15° C., g/cu m: 1.032
Sulfur, wt %: 5.43
Kin. vis., cSt @ 100° C.: 1,400
Con. carbon, wt %: 19.0
V/Ni, ppm: 175/63
Pen. @ 25° C., 0.1 mm: 180

Belayim, Egypt

Wadi el Feiran, Gulf of Suez

Crude
Gravity, °API: 27.5
Sulfur, wt %: 2.20
Vis., cSt @ 20° C.: 51.27
Pour pt, °C.: +6
Wax content, wt %: 8.0
Rvp, psi: 6.50
Carbon residue, wt %: 7.25
V/Ni, ppm: 79.4/54.6
C_1-C_4, yield, vol %: 2.43

Naphtha
Range, °C.: C_5-82
Yield, vol %: 5.12
RON, clear: 67.0
Ron + 0.4 Pb/l: 80.8

Naphtha
Range, °C.: 82-160
Yield, vol %: 10.15
Paraffins, vol %: 57.0
Napthenes, vol %: 33.0
Aromatics, vol %: 10.0
RON, clear: 47.2

Kerosine
Range, °C.: 160-230
Yield, vol %; 9.36
Gravity, °API: 45.4
Total sulfur, wt %: 0.36
Smoke pt, mm: 24
Aromatics, vol %: 16.7

Gas oil
Range, °C.: 230-350
Yield, vol %: 18.49
Gravity, °API: 34.0
Total sulfur, wt %: 1.47
Vis., cSt @ 20° C.: 6.532
Pour pt, °C: −7
Aniline pt, °C.: 69.2
Diesel index: 53.2

Vacuum distillate
Range, °C.: 350-550
Yield, vol %: 26.94
Gravity, °API: 23.2
Total sulfur, wt %: 2.19
Vis., cSt @ 50° C.: 36.24
Pour pt, °C.: +39
Carbon residue, wt %: 0.65
Basic N, ppm: 540
Total N, ppm: 1,813

Residue
Range, °C.: 350+
Yield, vol %: 54.45
Gravity, °API: 13.5
Total sulfur, wt %: 3.12
Vis., cSt @ 50° C.: 1,508
Pour pt, °C.: +30
Wax content, wt %: 13.7
Carbon residue, wt %: 12.10
V/Ni, ppm: 133.1/91.5

Burgan (Wafra), Divided Zone

Mina Saud, Divided Zone CBM, also Mina Abdulla, Kuwait

Crude
Gravity, °API: 23.3
Sulfur, wt %: 3.37
Pour pt, °F.: −5
Vis., Saybolt @ 122° F.: 134
Con. carbon, wt %: 7.7
Rvp, psi: 3.4
Salt content, lb/1,000 bbl: 17.5
V/Ni, ppm: 34/6.8

Light naphtha
Range, °F.: IBP-200
Yield, vol %: 3.20
Gravity, °API: 77.5
Sulfur, wt %: 0.01
Rvp, psi: 9.6
Paraffins, vol %: 74
Naphthenes, vol %: 25
Aromatics, vol %: 1
RON, clear: 73.1

Heavy naphtha
Range, °F.: 200-435
Yield, vol %: 13.62
Gravity, °API: 49.8
Sulfur, wt %: 0.15
Rvp, psi: 0.2
P/N/A, vol %: 44/36/20
RON, clear: 52.0
RON, + 3 g TEL: 68.0

Kerosine
Range, °F.: 435-500
Yield, vol %: 6.70
Gravity, °API: 38.5
Sulfur, wt %: 0.76
Aromatics, vol %: 37
Freezing pt, °F.: −47
Smoke pt, mm: 18
Aniline pt, °F.: 137.7
Cetane index: 47.3
ASTM, 50% pt, °F.: 456

Gas oil
Range, °F.: 500-620
Yield, vol %: 12.63
Gravity, °API: 32.7
Sulfur, wt %: 1.76
Pour pt, °F.: −5
Aniline pt, °F.: 153.3
Cetane index: 52.0

Residual oil
Range, °F.: 620 +
Yield, vol %: 63.45
Gravity, °API: 13.2
Sulfur, wt %: 4.45
Pour pt, °F.: +60
Con. carbon, wt %: 1.5

Residual oil
Range, °F.: 1,048 +
Yield, vol %: 34.23
Gravity, °API: 6.2
Sulfur, wt %: 5.43
Con. carbon, wt %: 20.3
V/Ni, ppm: 120/25

Dorrood (Darius), Iran

Kharg Island

Crude
Gravity, °API: 33.6
Sulfur, wt %: 2.35
Rvp, psi: 6.5
H_2S (evolved), wt %: 0.026
Pour pt, °F.: −4.5
Rams. carbon, wt %: 4.6
Kin. vis., cSt @ 100° F.: 5.65
V/Ni, ppm: 23/8
C_1-C_5, vol %: 6.35

Naphtha
Range (TBP), °F.: C_5-200
Yield, vol %: 10.1
Gravity, °API: 81.9
Sulfur, wt %: 0.067
Charac. factor: 12.70
Paraffins, vol %: 85.6
Naphthenes, vol %: 12.2
Aromatics, vol %: 2.2
RON/MON, clear: 61.7/61.1

Naphtha
Range (TBP), °F.: 200-320
Yield, vol %: 12.7
Gravity, °API: 59.0
Sulfur, wt %: 0.088
Charac. factor: 12.07
P/N/A, vol %: 67.5/17.8/14.8
RON/MON, clear: 33.0/ 35.9

Kerosine
Range, °F.: 320-520
Yield, vol %: 18.6
Gravity, °API: 44.9
Sulfur, wt %: 0.462
Charac. factor: 11.88
Aniline pt, °F.: 142.9
Diesel index: 64.1
Cetane index: 46.3
Freeze pt, °F.: −41
Cloud pt, °F.: −44
Pour pt, °F.: −49
Smoke pt, mm: 24
Naphthalenes, vol %: 2.66
Neut. no., mg Kott/g: 0.20
Vis., SUS @ 68° F.: 32.7

Gas oil
Range, °F.: 520-650
Yield, vol %: 11.5
Gravity, °API: 33.7
Sulfur, wt %: 1.68
Charac. factor: 11.76
Aniline pt, °F.: 162.3
Diesel index: 54.6
Cetane index: 49.9
Cloud pt, °F.: 26
Pour pt, °F.: 21
Vis., SUS @ 68° F.: 47.0

Residuum
Range, °F.: 650 +
Yield, vol %: 44.6
Gravity, °API: 14.5
Sulfur, wt %: 3.97
Pour pt: °F.: 58
Rams. carbon, wt %: 9.10
Vis., SUS @ 122° F.: 1,494.0
V/Ni, ppm: 45/16

Residuum
Range, °F.: 1,050 +
Yield, vol %: 17.9
Gravity, °API: 3.8
Sulfur, wt %: 5.38
Pour pt, °F.: 141
V/Ni, ppm: 101/36

Dubai (Fateh), Dubai, U.A.E.

SBMs in offshore Persian Gulf producing area

Crude
Gravity, °API: 31.05
Total sulfur, wt %: 2.0
Kin. vis., cSt @ 20° C.: 12.82
@ 40° C.: 7.05
Rvp, bar: 0.419
Pour pt, °C.: −9
Asphaltenes, wt %: 1.70
Con. carbon, wt %: 4.62
V/Ni, ppm: 42/14

Debutanized naphtha
Range, °C.: 15-145
Yield, vol %: 16.4
Gravity °API: 75.0
Vol % position in crude: 2.0-18.4
Total sulfur, ppm: 193
Rvp, bar: 0.44
Paraffins, vol %: 68.4
Naphthenes, vol %: 23.1
Aromatics, vol %: 8.5
RON, clear: 55.6

Kerosine
Range, °C.: 145-230
Yield, vol %: 15.0
Total sulfur, wt %: 0.25
P/N/A, vol %: 50.9/29.9/19.2
Smoke pt, mm: 22
Aniline pt, °C.: 56.0
Diesel index: 62.1
Cetane index: 56.0

Gas oil
Range, °C.: 145-350
Yield, vol %: 36.6
Gravity, °API: 38.6
Total sulfur, wt %: 1.04
Kin. vis., cSt @ 20° C.: 3.02
@ 40° C.: 1.99
Aniline pt, °C.: 60.8
Diesel index: 54.6
Cetane index: 51.0

Gas oil
Range, °C.: 175-400
Yield, vol %: 39.9
Gravity, °API: 34.1
Total sulfur, wt %: 1.43
UOP factor: 11.65

Residue
Range, °C.: 350 +
Yield, vol %: 45.0
Gravity, °API: 14.75
Total sulfur, wt %: 3.0
Kin. vis., cSt @ 50° C.: 351
@ 100° C.: 31.0
Pour pt, °C.: +19
Con. carbon, wt %: 9.1
V/Ni, ppm: 85/27

Dukhan (Qatar Land), Qatar

Umm Said terminal CBM & SBM

Crude
Gravity, °API: 41.7
Sulfur, wt %: 1.28
H_2S g/100 cc: 0.0283
Pour pt, °F.: −20
Rvp, psi: 11.7
Vis., SSU @ 80° F.: 43.3

Gasoline
Range, °F.: 40-155
Yield, vol %: 8.61
Gravity, °API: 86.5
Sulfur, wt %: 0.02
Paraffins, vol %: 95.0
Naphthenes, vol %: 3.9
Aromatics, vol %: 1.1

Light naphtha
Range, °F.: 155-265
Yield, vol %: 11.74
Gravity, °API: 64.3
Sulfur, wt %: 0.02
P/N/A, vol %: 67.8/19.7/12.5

Heavy naphtha
Range, °F.: 265-350
Yield, vol %: 10.65
Gravity, °API: 52.5
Sulfur, wt %: 0.03

P/N/A, vol %: 64.3/13.9/21.1
Dinaphthenes, vol %: 0.7
Smoke pt, calculated: 22.6

Kerosine
Range, °F.: 350-500
Yield, vol %: 15.83
Gravity, °API: 45.0
Cetane index (calculated): 51.1
Sulfur, wt %: 0.14
Aromatics, vol %: 21.1
Smoke pt: 21.0
Freeze pt, °F.: −42
Pour pt, °F.: −45

Heavy gas oil
Range, °F.: 500-650
Yield, vol %: 15.14
Cetane index (calculated): 55.1
Sulfur, wt %: 1.11
Total N, ppm: 35
Chloride, ppm: < 5.0
Pour pt, °F.: 15

Residue
Range, °F.: 650+
Yield, vol %: 32.66
Gravity, °API: 20.3
Sulfur, wt %: 2.58
Vis., SSU @ 210° F.: 73.2

Residue
Range, °F.: 650-1,000
Yield, vol %: 22.79
Gravity, °API: 24.1
Sulfur, wt %: 2.15
Total N, ppm: 525
Rams. carbon, wt %: 0.23
Vis., SSU @ 210° F.: 46.0

Pitch
Range, °F.: 1,000+
Yield, vol %: 9.87
Sulfur, wt %: 3.45
Con. carbon, wt %: 12.75
V/Ni, ppm: 19/3

Eocene (Wafra), Divided Zone

Mina Saud, Divided Zone CBM, also Mina Abdulla, Kuwait

Crude
Gravity, °API: 18.6
Sulfur, wt %: 4.55
Pour pt, °F.: −20
Vis., Saybolt 122° F.: 80.4
Con. carbon, wt %: 8.9
Rvp, psi: 1.1
Salt content, lb/1,000 bbl: 7.0

Light naphtha
Range, °F.: Ibp-200
Yield, vol %: 1.50
Gravity, °API: 77.6
Sulfur, wt %: 0.12
Rvp, psi: 11.4
Paraffins, vol %: 70
Naphthenes, vol %: 29
Aromatics, vol %: 1
RON, clear: 78.0
ASTM, 50% pt, °F.: 154

Heavy naphtha
Range, °F.: 200-435
Yield, vol %: 11.82
Gravity, °API: 51.0
Sulfur, wt %: 0.27
Rvp, psi: 1.4
P/N/A, vol %: 45/40/15
RON, clear: 48
RON, 3 g TEL: 60
ASTM, 50% pt, °F.: 325

Kerosine
Range, °F.: 435-500
Yield, vol %: 5.97
Gravity, °API: 36.9
Sulfur, wt %: 1.0
Aromatics, vol %: 30
Freezing pt, °F.: −66
Smoke pt, mm: 17
Aniline pt, °F.: 133.2
Cetane index: 43
ASTM, 50% pt, °F.: 458

Gas oil
Range, °F.: 500-620
Yield, vol %: 11.15
Gravity, °API: 31.0
Sulfur, wt %: 1.80
Pour pt, °F.: −30
Aniline pt, °F.: 145.8
Cetane index: 47
ASTM, 50% pt, °F.: 562

Residual oil
Range, °F.: 620+
Yield, vol %: 68.03
Gravity, °API: 10.0
Sulfur, wt %: 4.9
Pour pt, °F.: 60
Con. carbon, wt %: 14.83

Residual oil
Range, °F.: 1,044+
Yield, vol %: 39.75
Gravity, °API: 4.6
Sulfur, wt %: 6.1
Con. carbon, wt %: 22.5
V/Ni, ppm: 135/67

Foroozan (Fereidoon), Iran

Kharg Island

Crude
Gravity, °API: 31.3
Sulfur, wt %: 2.50
Rvp, psi: 5.7
H_2S (evolved), wt %: 0.015
Pour pt, °F.: −35
Neut. no., mg KOH/g: 0.70
Rams. carbon, wt %: 5.4
Kin. vis., cSt @ 68°F.: 15.33
V/Ni, ppm: 36/11
C_1-C_5, vol %: 6.35

Naphtha
Range, °F.: C_5-200
Yield, vol %: 9.9
Gravity, °API: 82.6
Sulfur, wt %: 0.017
Charac. factor: 12.72
Paraffins, vol %: 76.8
Naphthenes, vol %: 21.8
Aromatics, vol %: 1.4
RON/MON, clear: 64.3/62.6

Naphtha
Range, °F.: 200-320
Yield, vol %: 10.5
Gravity, API: 58.1
Sulfur, wt %: 0.056
Charac. factor: 12.02
P/N/A, vol %: 71.6/17.2/11.3
RON/MON, clear: 30.2/32.0

Kerosine
Range, °F.: 320-520
Yield, vol %: 17.7
Gravity, °API: 44.3
Sulfur, wt %: 0.435
Charac. factor: 11.84
Aniline pt, °F.: 145.2
Diesel index, °F.: 64.3
Cetane index: 45.4
Freeze pt, °F.: −41
Cloud pt, °F.: −52
Pour pt, °F.: −52
Smoke pt, mm: 22
Vis., SUS @ 68° F.: 32.4

Gas oil
Range, °F.: 520-650
Yield, vol %: 10.8
Gravity, °API: 33.4
Sulfur, wt %: 1.56
Charac. factor: 11.74
Aniline pt, °F.: 161.2
Diesel index: 53.8
Cetane index: 49.4
Cloud pt, °F.: 20
Pour pt, °F.: 19
Vis., SUS @ 68° F.: 48.0

Residuum
Range, °F.: 650+
Yield, vol %: 48.8
Gravity, °API: 13.6
Sulfur, wt %: 4.13
Pour pt, °F.: 34
Rams. carbon, wt %: 9.86
Vis., SUS @ 122 °F.: 3,616.0
V/Ni, ppm: 66/20

Residuum
Range, °F.: 1,050+
Yield, vol %: 20.4
Gravity, °API: 3.8
Sulfur, wt %: 5.6
Pour pt, °F.: 158
V/Ni, ppm: 143/44

Gulf of Suez Mix, Egypt

Ras Shukheir/3 conventional sea berths

Crude
Gravity, °API: 31.9
Sulfur, wt %: 1.52
Rvp, psi: 8.3
Pour pt, °F.: 35
Rams. carbon, wt %: 4.4
Kin. vis., cSt @ 100° F.: 8.74
V/Ni, ppm: 41/25
C_1-C_5, vol % yield: 5.48

Naphtha
Range (TBP), °F.: C_5-200
Yield, vol %: 7.8
Gravity, °API: 79.1
Total sulfur, wt %: 0.018
Rvp, psi: 10.7
Paraffins, vol %: 80.0
Naphthenes, vol %: 18.0
Aromatics, vol %: 2.0
RON, clear: 69.4
MON, clear: 66.1

Naphtha
Range (TBP), °F.: 200-320
Yield, vol %: 10.0
Gravity, °API: 56.7
Total sulfur, wt %: 0.022
Rvp, psi: 1.1
P/N/A, vol %: 57.3/32.7/10.1
RON, clear: 47.2
MON, clear: 43.9

Kerosine
Range (TBP), °F.: 320-520
Yield, vol %: 17.7
Gravity, °API: 42.6
Total sulfur, wt %: 0.395
Aniline pt, °F.: 138.6
Diesel index: 59.1
Cetane index: 43.0
Freeze pt, °F.: −48
Cloud pt, °F.: −42
Smoke pt, mm: 26
Naphthalenes, vol %: 2.88

Gas oil
Range (TBP), °F.: 520-650
Yield, vol %: 11.3
Gravity, °API: 33.9
Total sulfur, wt %: 1.2
Aniline pt, °F.: 159.1
Diesel index: 53.9
Cetane index: 50.21
Cloud pt, °F.: 26
Vis., SUS @ 68° F.: 49.8

Gas oil
Range (TBP), °F.: 650-850
Yield, vol %: 17.2
Gravity, °API: 27.2
Total sulfur, wt%: 1.6
Rams. carbon, wt %: 0.34

Residuum
Range, °F.: 650 +
Yield, vol %: 50.8
Gravity, °API: 17.2
Total sulfur, wt %: 2.365
Rams. carbon, wt %: 7.90
Vis., SUS @ 122° F.: 1,146.9
V/Ni, ppm: 73/46

Hout, Divided Zone

Sea berth off Ras Al Khafji

Crude
Gravity, °API: 32.8
Sulfur, wt %: 1.91
Rvp, psi: 4.6
Pour pt, °F.: −13.0
Kin. vis., cSt @ 86° F.: 9.88
Con. carbon, wt %: 5.01
Asphaltenes, wt %: 1.65
Wax content, wt %: 3.2
Neut. no., mg KOH/g: 0.04
C_1-C_4, vol %: 1.8
V/Ni, ppm: 28/6

Light naphtha
Range (TBP), °F.: C_5-176
Yield, vol %: 6.3
Gravity, °API @ 60° F.: 83.7
Sulfur, wt %: 0.029
H_2S, ppm: 19
Rvp, psi: 10.3
RON, clear: 64.6
RON + 3.0 ml TEL/gal: 84.2
MON, clear: 61.0
Paraffins, vol %: 92.6
Naphthenes, vol %: 6.4
Aromatics, vol %: 1.0

Full range naphtha
Range (TBP), °F.: C_5-374
Yield, vol %: 24.5
Gravity, °API: 63.5
Sulfur, wt %: 0.035
H_2S, ppm: 26
Rvp, psi: 4.3
RON, clear: 44.0
MON, clear: 43.6
Aniline pt, °F.: 134
P/N/A, vol %: 70.8/15.6/13.6

Kerosine
Range, °F.: 374-482
Yield, vol %: 11.3
Gravity, API @ 60° F.: 445
Sulfur, wt %: 0.204
Pour pt, °F.: −49
Cloud pt, °F.: −49
Freeze pt, °F.: −42
Smoke pt, mm: 23.5
Aniline pt, °F.: 147
Saturates, vol %: 81.5
Aromatics, vol %: 18.0
Olefins, vol %: 0.5

Gas oil
Range, °F.: 482-644
Yield, vol %: 15.0
Gravity, °API @ 60° F.: 36.0
Sulfur, wt %: 1.07
Kin. vis. @ 100 °F.: 3.954
Pour pt, °F.: 14
Aniline pt, °F.: 163
Cetane index: 56.5

Residue
Range, °F.: 644 +
Yield, vol %: 47.4
Gravity, °API @ 60° F.: 16.4
Sulfur, wt %: 3.39
Kin. vis., cSt @ 122° F.: 360.3
Pour pt, °F.: 68
Con. carbon, wt %: 10.3
V/Ni, ppm: 58/13

Residue
Range, °F.: 1,022 +
Yield, vol %: 21.8
Gravity, °API @ 60° F.: 7.9
Sulfur, wt %: 4.39
Kin. vis., cSt @ 210° F.: 118.6
Pour pt, °F.: 91
Con. carbon, wt %: 20.7
Asphaltenes, wt %: 6.42
V/Ni, ppm: 110/31

Iranian Heavy, Iran

Kharg Island

Crude
Gravity, °API: 31.0
Total sulfur, wt %: 1.65
Vis., cSt @ 70° F.: 16.84
Vis., cSt @ 100° F.: 9.36
Pour pt, °F.: −5
C_1-C_4 yield, vol %: 2.38

Gasoline
Range (TBP), °C.: C_5-65
Yield, vol %: 3.49
Sp. gr. 60/60 °F.: 0.6468
RON, clear: 73.0
Paraffins, wt %: 93.5
Naphthenes, wt %: 5.7
Aromatics, wt %: 0.8

Light naphtha
Range, °C.: 65-149
Yield, vol %: 14.53
Sp. gr., 60/60 °F.: 0.7392
Total sulfur, wt %: 0.088
P/N/A, wt %: 53.4/33.1/13.5

Heavy naphtha
Range, °C.: 149-262
Yield, vol %: 18.26
Sp. gr., 60/60 °F.: 0.8041
Total sulfur: 0.289
Freezing pt, °C.: −50.0
Aromatics, vol %: 17.8
Aniline pt, °C.: 59.1
Smoke pt, mm: 23

Gas oil
Range, °C.: 262-352
Yield, vol %: 14.60
Total sulfur, wt %: 1.22
Cloud pt, °F.: 28
Pour pt, °F.: 24
Diesel index: 52

Residue
Range, °C.: 352 +
Yield, vol %: 46.74
Total sulfur, wt %: 2.55
Vis., cSt @ 122° F.: 614
Vis, cSt @ 210° F.: 49.8
Con. carbon, wt %: 9.9
Asphaltenes, wt %: 3.8
V/Ni, ppm: 139/58

Assay sample taken at production rate of 1.84 million b/d with following field contributions in b/d:

Ahwaz—700,000
Gachsaran—628,000
Bibi Hakimeh—269,000
Kharg, Kupal, Monsuri and Rag E. Safid—251,000

Iranian Light, Iran

Kharg Island

Crude
Gravity, °API: 33.8
Pour pt, °F.: −20
Total sulfur, wt %: 1.35
Vis., cSt @ 70° F.: 10.58
@ 130° F.: 4.22

Gasoline
Range, °C.: C_5-65
Yield, vol %: 3.86
Sp. gr. 60/60° F.: 0.6465
RON, clear: 72.4
Paraffins, wt %: 94.4
Naphthenes, wt %: 4.8
Aromatics, wt %: 0.8

Light naphtha
Range, °C.: 65-149
Yield, vol %: 14.17
Sp. gr. 60/60° F.: 0.7387
Total sulfur, wt %: 0.040
P/N/A, wt %: 57.5/31.1/11.4

Heavy naphtha
Range, °C.: 149-262
Yield, vol %: 20.45
Sp. gr., 60/60° F.: 0.8028
Total sulfur, wt %: 0.198
Freezing pt, °C.: −—49
Aromatics, vol %: 18.0
Aniline pt, °C: 60.3
Smoke pt, mm: 24

Gas oil
Range, °C.: 262-352
Yield, vol %: 15.32
Sp. gr. 60/60° F.: 0.8599
Total sulfur, wt %: 1.05
Cloud pt, °F.: 28
Pour pt, °F.: 24
Diesel index: 53

Residue
Range, °C.: 352 +
Yield, vol %: 43.3
Sp. gr. 60/60° F.: 0.9531
Total sulfur, wt %: 2.42
Vis., cSt @ 122° F.: 297.0
@ 210° F.: 29.8
Con. carbon, wt %: 9.0
Asphaltenes, wt %: 1.2
V/Ni, ppm: 70/32

Assay sample taken at production rate of 2.6 million b/d with following field contributions in b/d:

Agha Jari—870,000
Marun—1.03 million
Karanj—356,000
Paris—279,000
Pazanan—33,000

Khafji, Divided Zone

Sea berth off Ras Al Khafji

Crude
Gravity, °API: 28.5
Sulfur, wt %: 2.85

H_2S (dissolved), ppm: <1
Rvp, psi: 7.6
Pour pt, °F.: −31
Kin. vis., cSt @ 86° F.: 21.3
Con. carbon residue, wt %: 8.04
Asphaltenes, wt %: 4.32
Wax content, wt %: 2.7
Neut. no., mg KOH/g: 0.18
C_1-C_4, vol %: 3.41
V/Ni, ppm: 55/16

Light naphtha
Range (TBP), °F.: C_5-176
Yield, vol %: 5.5
Gravity, °API @ 60°F.: 85.2
Sulfur, wt %: 0.0028
Rvp, psi: 10.8
RON, clear: 66.2
RON + 1.0 ml TEL/gal: 78.5
MON, clear: 63.4
Paraffins, vol %: 93.9
Naphthenes, vol %: 5.4
Aromatics, vol %: 0.7

Full range naphtha
Range (TBP), °F.: C_5-374
Yield, vol %: 20.4
Gravity, °API @ 60° F.: 65.0
Sulfur, wt %: 0.0264
Rvp, psi: 4.3
RON, clear: 41.0
RON + 1 ml TEL/gal: 53.1
MON, clear: 41.2
Aniline pt, °F.: 139
P/N/A, vol %: 73.4/15.4/11.2

Kerosine
Range (TBP), °F.: 374-482
Yield, vol %: 9.5
Gravity, °API @ 60° F.: 44.5
Sulfur, wt %: 0.324
Cloud pt, °F.: −45
Freeze pt, °F.: −45
Smoke pt, mm: 23.7
Aniline pt, °F.: 145
Saturates, vol %: 80.5
Aromatics, vol %: 19.0
Olefins, vol %: 0.5

Gas oil
Range (TBP), °F.: 482-644
Yield, vol %: 13.9
Sulfur, wt %: 1.42
Kin. vis. @ 100° F.: 3.9
Pour pt, °F.: 10
Cloud pt, °F.: 10
Aniline pt, °F.: 156
Cetane index: 54.2

Residue
Range (TBP), °F.: 644+
Yield, vol %: 52.8
Gravity, °API @ 60° F.: 12.1
Sulfur, wt %: 4.46
Kin. vis., cSt @ 122° F.: 1,795
Pour pt, °F.: 50
Con. carbon, wt %: 13.4
Asphaltenes, wt %: 7.84
V/Ni, ppm: 95/28

Residue
Range (TBP), °F.: 991+
Yield, vol %: 27.8
Gravity, °API @ 60°F.: 4.5
Sulfur, wt %: 5.65
Kin. vis., cSt @ 210° F.: 6,043
Pour pt, °F.: 145
Con. carbon, wt %: 24.4
Asphaltenes, wt %: 15.4
V/Ni, ppm: 170/49

Kirkuk Blend, Iraq

Mina-al-Bakr sea terminal in Persian Gulf also Ceyhan (Dortyol), Turkey

Crude
Gravity, °API: 35.1
Sulfur, wt %: 1.97
Pour pt, °C.: −22
Kin. vis., cSt @ 10° C.: 12.8
C_4 & lighter, wt %: 1.8

Light SR naphtha
Range, °C.: C_5-65
Yield, wt %: 4.1
Density @ 15° C., g/cu m: 0.644
RON + 0.4 g Pb/l: 81

Heavy SR naphtha
Range, °C.: 65-175
Yield, wt %: 18.1
Density @ 15° C., g/cu m: 0.740
RON + 0.4 g Pb/l: 58.5
Aromatics, vol %: 10.5
Naphthenes, vol %: 22

Kerosine
Range, °C.: 175-225
Yield, wt %: 8.7
Density @ 15° C., g/cu m: 0.794
Sulfur, wt %: 0.19

Gas oil
Range, °C.: 225-360
Yield, wt %: 24.0
Density @ 15° C., g/cu m: 0.843
Sulfur, wt %: 1.18
Pour pt, °C.: −12
Cold filter pour pt, °C.: −9
Kin. vis., cSt @ 100° C.: 1.34

Heavy gas oil
Range, °C.: 360-525
Yield, wt %: 22.9
Density @ 15° C., g/cu m: 0.917
Sulfur, wt %: 2.35
Kin. vis., cSt @ 100° C.: 7.98

Long residuum
Range, °C.: 360+
Yield, wt %: 43.3
Density @ 15° C., g/cu m: 0.968
Sulfur, wt %: 3.76
Kin. vis., cSt @ 100° C.: 42.9

Short residuum
Range, °C.: 525+
Yield, wt %: 20.4
Density @ 15° C., g/cu m: 1.003
Sulfur, wt %: 5.30
Kin. vis., cSt @ 100° C.: 1,550
Con. carbon, wt %: 21.0
V/Ni, ppm: 142/54

Kuwait Export, Kuwait

Mina al Ahmadi

Crude
Gravity, °API: 31.4
Vis., SUV, sec @ 100° F.: 58.1
Pour pt, °F.: +5
Sulfur, wt %: 2.52
Ni/V (calc.), ppm: 8/30
Rvp, psi: 6.7
H_2S, wt %: <0.001
C_1-C_4 (GC analysis), vol %: 3.03

Naphtha
Range, °F.: Over point — 140
Yield, vol %: 3.80
Gravity, °API: 89.7
Sulfur, wt %: 0.04
RON (micro), clear: 71.8
RON + 3 ml TEL: 89.3

Naphtha
Range, °F.: 140-170
Yield, vol %: 2.26
Gravity, °API: 78.6
Sulfur, wt %: 0.02
Aniline pt, °F.: 147.7
RON, clear/+ 3 ml TEL: 58.2/80.40
Paraffins, vol %: 88.5
Monocycloparaffins, vol %: 9.9
Aromatics, total, vol %: 1.6

Heavy naphtha
Range, °F.: 170-310
Yield, vol %: 11.91
Gravity, °API: 62.1
Sulfur, wt %: 0.03
Aniline pt, °F.: 136.2
Paraffins, vol %: 70.1
Monocycloparaffins, vol %: 20.4
Dicycloparaffins, vol %: 0.4
Aromatics, total, vol %: 9.1

Kerosine
Range, °F.: 310-520
Yield, vol %: 18.43
Gravity, °API: 45.9
Pour pt, °F.: −45
Sulfur, wt %: 0.39
Aniline pt, °F.: 142.9
Cetane index: 53.8
Smoke pt, mm: 26

Heating oil
Range, °F.: 520-680
Yield, vol %: 14.89
Gravity, °API: 32.9
Vis., SUV, sec. @ 100° F.: 43.3
Pour pt, °F.: +20
Total N, ppm: 100
Sulfur, wt %: 1.98
Aniline pt, °F.: 160.2
Cetane index: 54.3

Gas oil
Range, °F.: 680-1,000
Yield, vol %: 24.09
Gravity, °API: 21.4
Pour pt, °F.: +100
Sulfur, wt %: 3.12
Total N, ppm: 900
Ni/V, ppm: <0.1/<0.1
Vis., SUV, sec @ 130° F.: 175.2
Rams. carbon residue, wt %: 0.47

Residuum
Range (VEFV), °F.: 1,000+
Yield, vol %: 21.78
Gravity, °API: 5.8
Sulfur, wt %: 5.11
V/Ni, ppm: 116/34
Vis., SUV, sec @ 250° F.: 3,394
Rams. carbon residue, wt %: 21.9

Mubarek, Sharjah, U.A.E.

Floating storage and loading facility in offshore producing area

Crude
Gravity, °API: 37
Sulfur, wt %: 0.62
Rvp, psi: 4.8
Pour pt, °F.: 10
Salt, lb/1,000 bbl: 23
Vis., cSt @ 100° F.: 3.20
@ 122° F.: 2.80
Gas, vol % of crude: 0.7

Light straight run
Range, °F.: ibp-220
Yield, vol %: 12.7
Octane, F-1 clear: 68.2
Gravity, °API: 72.2
Rvp, psi: 11.8
Sulfur, wt %: 0.01

Light naphtha
Range, °F.: 220-300
Yield, vol %: 9.1
Paraffins, vol %: 51.6
Naphthenes, vol %: 30.4
Aromatics, vol %: 18.0
Octane, F-1 clear: 50.5
Gravity, °API: 55.2
Sulfur, wt %: 0.01

Heavy naphtha
Range, °F.: 300-360
Yield, vol %: 7.2
P/N/A, vol %: 48.5/28.8/22.7
Gravity, °API: 49.9
Sulfur, wt %: 0.01

Kerosine
Range, °F.: 360-500
Yield, vol %: 17.6
Gravity, °API: 42.7
Smoke pt, mm: 25
Aniline pt, °F.: 134
Diesel index: 57.2
Pour pt, °F.: −55
Sulfur, wt %: 0.04
Vis., cSt @ 100° F.: 1.40

Light gas oil
Range, °F.: 500-700
Yield, vol %: 21.4
Gravity, °API: 32.6
Aniline pt, °F.: 156
Diesel index: 50.9
Pour pt, °F.: 20
Rams. carbon residue, wt %: 0.66
Sulfur, wt %: 0.66
Vis., cSt @ 100° F.: 4.55
  @ 210° F.: 1.54
Bromine no.: 0.6

Residuum
Range, °F.: 700 +
Yield, vol %: 30.8
Gravity, °API: 19.6
Rams. carbon residue, wt %: 4.74
Sulfur, wt %: 1.18

Residuum
Range, °F.: 1,000 +
Yield, vol %: 9.2
Gravity, °API: 12.2
Rams. carbon residue, wt %: 15.09
Sulfur, wt %: 1.43
V/Ni, ppm: 11.40/6.0

Murban, Abu Dhabi

Port of Jebel Dhanna/4 CBM berths

Crude
Gravity, °API: 40.45
Rvp @ 37.8° C., psia: 3.46
Pour pt, °C.: −24
Kin. vis., cSt @ 40° C.: 2.70
Sulfur, wt %: 0.78
V/Ni, ppm: <0.1/0.7
Con. carbon, wt %: 1.35
Charac. factor, K_{UOP}: 12.1

Naphtha
Range (TBP), °C.: 20-165
Yield, vol %: 27.4
Position on crude, vol %: 1.9-29.3
Gravity, °API: 63.47
Sulfur, ppm: 43
RON, clear: 50

Naphtha
Range (TBP), °C.: 20-180
Yield, vol %: 31.2
Position on crude, vol %: 1.9-33.1
Gravity, °API: 61.48
Sulfur, ppm: 64
RON, clear: 47

Kerosine
Range (TBP), °C.: 150-220
Yield, vol %: 16.6
Position on crude, vol %: 25.3-41.9
Gravity, °API: 18.22
Smoke pt, mm: 24
Freeze pt, °C.: −46
Aromatics, vol %: 21
Aniline pt, °C.: 55.2
Sulfur, wt %: 0.022

Diesel
Range (TBP), °C.: 220-350
Yield, vol %: 26.0
Gravity, °API: 37.37
Sulfur, wt %: 0.62
Cloud pt, °C.: −12
Pour pt, °C.: −12
Vis., cSt @ 100° C.: 1.25
Aniline pt, °C.: 72.3
Diesel index: 60.6
Cetane index: 60
Con. carbon on 10% residue, wt %: <0.01

Residuum
Range (TBP), °C.: 350 +
Yield, vol %: 32.1
Gravity, °API: 22.72
Sulfur, wt %: 1.73
Vis., cSt @ 100° C.: 10.85
Con. carbon, wt %: 4.3
Asphaltenes, wt %: 0.15
Pour pt, °C.: +33
V/Ni, ppm: 0.4/2.0
Flash pt, °C.: 214
Nitrogen, wt %: 0.125

Residuum
Range (TBP), °C.: 540 +
Yield, vol %: 9.3
Gravity, °API: 13.99
Sulfur, wt %: 2.20
Vis., cSt @ 50° C.: 3,340.
Con. carbon, wt %: 11.5
Asphaltenes, wt %: 0.74

Oman Export, Oman

Mina al Fahal

Crude
Gravity, °API: 36.3
Sulfur, wt %: 0.79
Pour pt, °F.: −15
Rvp, psi: 4.2
Vis., SUS @ 60° F.: 64.8
Yield, ibp to 113 °F., vol %: 3.63

Fraction yields (partial)
Range/vol %:
  390-450/6.73
  450-500/5.74
  500-550/5.64
  550-650/10.76

Straight run
Range, °F.: 113-220
Yield, vol %: 7.54
Gravity, °API: 70.4
RON + 3 cc Pb: 74.2
Sulfur, wt %: 0.0
Paraffins, vol %: 77.0
Naphthenes, vol %: 18.24
Aromatics, vol %: 4.8

Naphtha
Range, °F.: 220-390
Yield, vol %: 17.77
Gravity, °API: 55.3
Sulfur, wt %: 0.03
P/N/A, vol %: 67.6/21.3/10.1
Dinaphthenes, vol %: 1.0

Kerosine
Range, ° F.: 315-500
Yield, vol %: 20.56
Gravity, °API: 46.5
Sulfur wt %: 0.12
Aromatics, vol %: 12.9
Smoke pt, mm: 26
Freeze pt, °F.: −56
Pour pt, °F.: −70

Light gas oil
Range, °F.: 450-650
Yield, vol %: 22.14
Gravity, °API: 37.5
Cetane index: 57.0
Sulfur, wt %: 0.42
Total N, ppm: 31
Aniline pt, °F.: 168.3
Pour pt, °F.: −15

Heavy gas oil
Range, °F.: 650-1,000
Yield, vol %: 26.15
Gravity, °API: 26.8
Sulfur, wt %: 0.98
Total N, ppm: 516
Pour pt, °F.: 70
Carbon residue, wt %: 0.14

Flashed residue
Range, °F.: 1,000 +
Yield, vol %: 16.03
Gravity, °API: 14.2
Sulfur, wt %: 1.96
Vis., SSF @ 210 °F.: 196.0

Qatar Marine, Qatar

Halul Island

Crude
Gravity, °API: 35.3
Sulfur, wt %: 1.57
Pour pt, °F.: 10
H_2S g/100 cc: 0.0315
Vis., SSU @ 60° F.: 53.4

Light straight run
Range, °F.: 40-155
Yield, vol %: 6.45
Gravity, °API: 82.5
Sulfur, wt %: 0.05
P/N/A, vol %: 88.7/9.5/1.7

Light naphtha
Range, °F.: 155-265
Yield, vol %: 9.45
Sulfur, wt %: 0.03
Paraffins, vol %: 60.6
Naphthenes, vol %: 23.3
Aromatics, vol %: 16.1

Heavy naphtha
Range, °F.: 265-350
Yield, vol %: 10.07
Gravity, °API: 51.8
Sulfur, wt %: 0.04
P/N/A: 56.7/18.5/22.9
Dinaphthenes, vol %: 1.9

Kerosine
Range, °F.: 350-500
Yield, vol %: 16.28
Gravity, °API: 43.1
Cetane index (calculated): 47.5
Sulfur, wt%: 0.18
Aromatics, vol %: 24.0
Smoke pt, mm: 19.0
Freeze pt, °F.: −44
Pour pt, °F.: −50

Heavy gas oil
Range, °F.: 500-650
Yield, vol %: 15.50
Cetane index (calculated): 51.6
Sulfur, wt %: 1.24
Total N, ppm: 72
Pour pt, °F.: 25

Residue
Range, °F.: 650+
Yield, vol %: 39.53
Gravity, °API: 16.5
Sulfur, wt %: 2.73
Vis., SUS @ 210° F.: 121.5

Residue
Range, °F.: 1,000+
Yield, vol %: 19.33
Gravity, °API: 10.3
Sulfur, wt %: 3.4
Con. carbon, wt %: 12.5
V/Ni, ppm: 31/7

Rostam, Iran

Lavan Island terminal

Crude
Gravity, °API: 35.9
Vis., cSt @ 50° C.: 3.08
Pour pt, °C.: −22.5
Sulfur, wt %: 1.55
NaCl, wt%: 0.036

Gasoline
Range, °F.: Ibp-165
Yield, vol %: 24.2
RON, clear: 61.4

Kerosine
Range, °C.: 165-220
Yield, vol %: 11.2

Gas oil
Range, °C.: 220-310
Yield, vol %: 17.3

Residuum
Yield, vol %: 45.8
Pour pt, °C.: +12.5
Sulfur, wt %: 2.82
Carbon, wt %: 6.25

Note: Same assay first published in 1976.

Salmon (Sassan), Iran*

Levan Island

Crude
Gravity, °F.: 33.9
Paraffin, wt%: 1.9
Sulfur, wt %: 1.91
Pour pt, °F.: −5
Vis., SUS @ 77° F.: 52.1
@100° F.: 44.2
Bs&w: 17,550

Straight-run gasoline
Range, vapor-cut points, °F.: 50-200
Yield, vol %: 10.5
Gravity, °API: 77.6
Sulfur, wt %: 0.081
Mercaptan sulfur: 0.067
Octane no., F-1 clear: 61.0

Naphtha
Range, VCP, °F.: 200-375
Yield, vol %: 16.4
Gravity, °API: 53.3
Sulfur, wt %: 0.0820
Mercaptan S, wt %: 0.002
Aniline pt, °F.: 121.5
Octane no., F-1 clear: 35.4
Arom. + naphthenes, vol %: 41

Kerosine
Range VCP, °F.: 375-450
Yield, vol %: 7.5
Gravity, °API: 45.1
Sulfur, wt %: 0.19
Freezing pt, °F.: −50
Aniline pt, °F.: 137.9
Smoke pt, mm: 20
Kin. vis., cSt @ 60° F.: 2.05
@ 100° F.: 30

Gas oil
Range VCP, °F.: 450-700
Yield, vol %: 23.8
Gravity, °API: 34.1
Sulfur, wt %: 1.2
Pour pt, °F.: +15
Aniline pt, °F.: 153.3
Kin. vis., cSt @ 60° F.: 7.52
@ 100° F.: 4.03
Cetane no.: 56.3

Residual oil
Range VCP, °F.: 700+
Yield, vol %: 39.7
Gravity, °API: 15.3
Sulfur, wt %: 3.5
Pour pt, °F.: +75
Vis., SUS @ 210° F.: 154
@ 275° F.: 67.8
V + Ni, ppm: 44

Residual oil
Range, VCP, °F.: 1,070+
Yield, vol %: 12.0
Gravity, °API: 1.3
Sulfur, wt %: 5.0
Vis., SUS @ 210° F.: 8,000
@ 275° F.: 1,000
V + Ni, ppm: 127

* New assay not available. This one first published in OGJ in 1976. Sassan is produced from same reservoir as Abu Al Bu Khoosh.

Sirri, Iran

Offshore terminal in Persian Gulf producing area

Crude
Gravity, °API: 30.9
Kin. vis., cSt @ 10° C.: 20.3
@ 37.8° C.: 7.36
Pour pt, °C.: −9
Total sulfur, wt %: 2.3
Rvp, bars: 0.650
Paraffins, wt %: 3.43
Asphaltenes, wt %: 1.48
V/Ni/Fe, ppm: 41/12/3
Yield C_1—C_5, vol %: 7.14

Light gasoline
Range, °C.: C_5-80
Yield, vol %: 5.19
RON, clear: 64.1
Total sulfur, wt %: 0.0080

Heavy gasoline
Range, °C.: 80-180
Yield, vol %: 15.28
Paraffins, vol %: 59.0
Naphthenes, vol %: 30.0
Aromatics, vol %: 11.0
Sulfur, wt %: 0.078

Kerosine
Range, °C.: 180-225
Yield, vol %: 7.54
Smoke pt, mm (150°-225° C.): 18.50
Sulfur, wt %: 0.436

Gas oil
Range, °C.: 180-350
Yield, vol %: 29.61
Pour pt, °C.: −21
Total sulfur, wt %: 1.42
Aniline pt, °C.: 62.2
Diesel index (calculated): 51.9

Residue
Range, °C.: 350+
Yield, vol %: 46.33
Pour pt, °C.: +21
Kin. vis., cSt @ 50° C.: 375
@ 70° C.: 120
Total sulfur, wt %: 3.65
Asphaltenes, wt %: 3.01
Con. carbon, wt %: 9.53
V/Ni/Fe, ppm: 70/20/4

Soroosh (Cyrus), Iran

Offshore terminal with SBM in production area

Crude
Gravity, °API: 18.1
Sulfur, wt %: 3.3
Rvp, psi: 0.3
H_2S (evolved), wt %: 0.007
Pour pt, °F.: 10
Neut. no., mg KOH/g: 0.50
Rams. carbon, wt %: 12.2
Kin. vis., cSt @ 68° F.: 1,381.4
V/Ni, ppm: 101/35
C_1-C_5, vol %: 1.32

Naphtha
Range, °F.: C_5-200
Yield, vol %: 3.3
Gravity, °API: 77.3
Sulfur, wt %: 0.008
Charac. factor: 12.49
Paraffins, vol %: 69.1
Naphthenes, vol %: 29.7
Aromatics, vol %: 1.1
RON/MON, clear: 73.5/70.6

Naphtha
Range, °F.: 200-320
Yield, vol %: 5.1
Gravity, °API: 57.8
Sulfur, wt %: 0.021
Charac. factor: 12.00
P/N/A, vol %: 49.0/42.2/8.8
RON/MON, clear: 49.9/50.5

Kerosine
Range, °F.: 320-520
Yield, vol %: 11.6
Gravity, °API: 42.5
Sulfur, wt %: 0.37
Charac. factor: 11.76
Aromatics, vol %: 15.7
Aniline pt, °F.: 140.8
Diesel index: 59.8
Cetane index: 44.6
Freeze pt, °F.: −46
Cloud pt, °F.: −41
Pour pt, °F.: −55
Smoke pt, mm: 25
Neut no., mg KOH/g: 0.10
Vis., SUS @ 68° F.: 32.6

Gas oil
Range, °F.: 520-650
Yield, vol %: 9.6
Gravity, °API: 33.0
Sulfur, wt %: 1.19
Charac. factor: 11.72
Aniline pt, °F.: 152.9
Diesel index: 50.5

Cetane index: 49.0
Cloud pt, °F.: 11
Pour pt, °F.: 6
Naphthalenes, vol %: 13.68
Vis., SUS @ 68 °F.: 47.9

Residuum
Range, °F.: 650°
Yield, vol %: 70.1
Gravity, °API: 9.2
Sulfur, wt %: 4.3
Pour pt, °F.: 99
Rams. carbon, wt %: 16.31
Vis., SUS @ 210° F.: 1,439.8
V/Ni, ppm: 135/47

Residuum
Range, °F.: 1,050+
Yield, vol %: 36.5
Gravity, °API: −0.2
Sulfur, wt %: 5.6
Pour pt, °F.: 213
V/Ni, ppm: 237/82

Souedie, Syria

Tartus/CBMs

Crude
Gravity, °API: 24.9
Sulfur, wt %: 3.82
Pour pt, °C.: −30
Kin. vis. @ 10° C.: 88.3
C_4 & lighter: 0.8

Light SR naphtha
Range, °C.: C_5-65
Yield, wt %: 3.2
Density @ 15° C., g/cu cm: 0.647
RON + 0.4 g Pb/l: 79.5

Heavy SR naphtha
Range, °C.: 65-175
Yield, wt %: 13.1
Density @ 15° C., g/cu m: 0.734
RON + 0.4 g Pb/l: 58
Naphthenes, vol %: 18
Aromatics, vol %: 10.5

Kerosine
Range, °C.: 175-225
Yield, wt %: 6.0
Density @ 15° C., g/cu m: 0.798
Sulfur, wt %: 0.38

Gas oil
Range, °C.: 225-360
Yield, wt %: 19.7
Density @ 15° C., g/cu m: 0.865
Sulfur, wt %: 2.50
Pour pt, °C.: −14
CFPP, °C.: −11
Kin. vis., cSt @ 100° C.: 1.40

Heavy gas oil
Range, °C.: 360-425
Yield, wt %: 9.8
Density @ 15° C., g/cu m: 0.925
Sulfur, wt %: 3.90
Kin. vis., cSt @ 100° C.: 4.3

Long residuum
Range, °C.: 360+
Yield, wt %: 57.2
Density @ 15° C., g/cu m: 1.015
Sulfur, wt %: 5.90
Kin. vis., cSt @ 100° C.: 330.0

Short residuum
Range, °C.: 425+
Yield, wt %: 47.4
Density @ 15° C., g/cu m: 1.040
Sulfur, wt %: 6.0
Kin. vis., cSt @ 100° C.: 1,800
Con. carbon residue, wt %: 21.5
V/Ni, ppm: 185/60

Umm Shaif (Abu Dhabi Marine), Abu Dhabi

Das Island

Crude
Gravity, °API: 37.4
Sulfur, wt %: 1.51
Pour pt, °C.: −30
Rvp @ 37.8° C., psia: 7.05
H_2S, ppm: <2
Asphalt, wt %: 0.13

Light naphtha
Range (TBP), °C.: C_5-80
Yield, vol %: 8.2
Gravity, °API: 83.1
Charac. factor K: 12.73
Sulfur, ppm: 1,030
RON, clear: 65
RON + 1.5 ml/v.s. gal TEL: 74.5
MON, clear: 61

Heavy naphtha
Range (TBP), °C.: 80-150
Yield, vol %: 13.7
Gravity, °API: 59.26
Sulfur, wt %: 0.052

Kerosine
Range (TBP), °C.: 150-230
Yield, vol %: 15.8
Gravity, °API: 47.53
Freeze pt, °C.: −53.0
Aniline pt, °C.: 54.6
Aromatics, vol %: 21.0
Smoke pt, mm: 23.0
Sulfur, wt %: 0.095

Diesel
Range (TBP), °C.: 230-375
Yield, vol %: 25.8
Gravity, °API: 34.49
Sulfur, wt %: 1.18
Pour pt, °C.: −12
Aniline pt, °C.: 69.6
Diesel index: 54.8
Cetane index: 51.2

Residue
Range (TBP), °C.: 350+
Yield, vol %: 37.4
Gravity, °API: 19.1
Kin. vis., cSt @ 50° C.: 104.7
Pour pt, °C.: +27
Sulfur, wt %: 2.78
Asphaltenes, wt %: 0.1
Con. carbon, wt %: 5.3
V/Ni, ppm: 7.1/1.9

Residue
Range (TBP), °C.: 550+
Yield, vol %: 12.3
Gravity, °API: 10.15
Kin. vis., cSt @ 100° C.: 315
Pour pt, °C.: +21
Sulfur, wt %: 3.73
Asphaltenes, wt %: 0.24
Con. carbon, wt %: 14.4
V/Ni, ppm: 19.0/5.0

Zakum (Lower Zakum/Abu Dhabi Marine), Abu Dhabi

Das Island

Crude
Gravity, °API: 40.6
Rvp @ 37.8 °C., psia: 8.37
Pour pt, °C.: −21
Kin. vis., cSt @ 20° C.: 4.28
Sulfur, wt %: 1.05
Charac. factor, K_{UOP}: 12.28
Asphaltene content, wt %: 0.05

Light straight run
Range (TBP), °C.: C_5-80
Yield, vol %: 8.6
Gravity, API: 82.7
Rvp @ 100 °F., psia: 11.6
Sulfur, ppm: 1.5
RON, clear: 66
MON, clear: 64

Naphtha
Range (TBP), °C.: C_5-160
Yield, vol %: 25.60
Gravity, °API: 66.5
Sulfur, ppm: 16.0

Kerosine
Range (TBP), °C.: 160-250
Yield, vol %: 18.8
Gravity, °API: 46.15
Kin. vis., cSt @ −20° C.: 4.10
Freeze pt, °C.: −48
Aniline pt, °C.: 58
Aromatics, vol %: 21.7
Smoke pt, mm: 23.5
Sulfur wt %: 0.063

Diesel
Range (TBP), °C.: 190-343
Yield, vol %: 29.30
Gravity, °API: 39.52
Sulfur, wt %: 0.52
Cloud pt, °C.: −18
Pour pt, °C.: −21
Vis., cSt @ 40° C.: 2.20
Aniline pt, °C.: 66.8
Diesel index: 60.2
Cetane index: 56.5

Residue
Range, °C.: 350+
Yield, vol %: 33.7
Gravity, °API: 21.8
Kin. vis., cSt @ 50° C.: 69.1
Pour pt, °C.: +33
Sulfur, wt %: 2.2
Asphaltenes, wt %: 0.2
Con. carbon, wt %: 4.0
V/Ni, mg/kg: 1.0/0.9

Residue
Range, °C.: 550+
Yield, vol %: 10.10
Gravity, °API: 13.2
Kin. vis., cSt @ 100° C.: 147.6
Pour pt, °C.: +18
Sulfur, wt %: 2.96
Asphaltenes, wt %: 1.0
Con. carbon, wt %: 13.6
V/Ni, mg/kg: 3.0/2.5

North Sea

Argyll, U.K. North Sea

SBM in producing area

Crude
Density @ 15° C.: 0.8349
Sulfur, wt %: 0.18
Pour pt, °C.: +6
Vis., cSt @ 40° C.: 4.79

Naphtha
Range, °C.: Ibp—175
Yield, vol %: 25.2
Density @ 15° C.: 0.728
Sulfur, wt %: <0.001

Kerosine
Range, °C.: 175-260
Yield, vol %: 14.9

Density @ 15° C.: 0.804
Sulfur, wt %: 0.03
Copper strip test: 1.A
Smoke pt, mm: 22
Freeze pt, °C.: —37

Gas oil
Range, °C.: 260-360
Yield, vol %: 18.9
Density @ 15° C.: 0.839
Sulfur, wt %: 0.11
Cetane index: 64.5
Cloud pt, °C.: 0
Pour pt, °C: —3
Cold filter pt, °C.: —2
Vis., cSt @ 40° C.: 4.45

Residue
Range, °C.: 360+
Yield, vol %: 40.6
Density @ 15° C.: 0.9136
Sulfur, wt %: 0.34
V/Ni/Fe, ppm: 3.9/2.1/2.7
Pour pt, °C: +30
Vis., cSt @ 100° C.: 17.19

Auk, U.K. North Sea

SBM in producing area

Crude
Gravity, °API @ 60° F.: 37.15
Sulfur, wt %: 0.45
Wax, wt %: 6.5
Pour pt (ASTM max.), °C./°F.: +9/+50
Kin. vis., cSt @ 40° C.: 4.38
H_2S existent/potential ppm: <1/<1
Acid value, mg KOH/g (TAN): 0.13
Rvp, lb: 6
C_4—, vol %/wt %: 2.2/1.5

Gasoline
Range, °C.: C_5—85
Yield, vol %/wt %: 8.0/6.5
Sp gr @ 15° C.: 0.685
RON, clear: 66
RON + 0.5 g Pb/l Pb: 82

Naphtha
Range, °C.: 85-165
Yield, vol %/wt %: 15.5/14.0
Sp gr @ 15° C.: 0.755
Sulfur, wt %: 0.002
P/N/A, wt %: 51/34/15

Kerosine
Range, °C.: 165-235
Yield, vol %/wt %: 13.0/12.5
Sp gr @ 15° C.: 0.802
Sulfur, wt %: 0.01
Smoke pt, mm: 25
Aromatics, vol %: 19

Gas oil
Range, °C.: 235-300
Yield, vol %/wt %: 12.5/12.4
Sp gr @ 15° C.: 0.828
Sulfur, wt %: 0.09
Cetane no.: 60
Cloud pt, °C: —19

Gas oil
Range, °C.: 300-350
Yield, vol %/wt %: 9.4/9.6
Sp gr @ 15° C.: 0.847
Sulfur, wt %: 0.35
Cetane no.: 63
Cloud pt, °C.: +9
Kin. vis., cSt @ 40° C.: 5.53

Residue
Range, °C.: 350+
Yield, vol %/wt %: 39.2/43.5
Sp gr @ 15° C.: 0.932
Sulfur, wt %: 0.93
Wax, wt %: 13
Pour pt, °C.: +45
Kin vis., cSt @ 60° C.:96.7

@ 100° C.: 20.7
Acid value: 0.15
Asphaltenes, wt %: 4.0
Con. car. residue: 7%
V/Ni, ppm: 14/3

Beatrice, U.K. North Sea

Nigg Bay terminal

Crude
Gravity, °API: 38.7
Sulfur, wt %: 0.05
Pour pt, °F.: 55
Rvp, psi.: 5.60
Vis., cSt @ 104° F.: 6.85
@ 122° F.: 5.15
C_1—C_5, yield, vol %: 3.77

Light naphtha
Range, VT °F.: 68-158
Yield, vol %: 3.6
Gravity, °API: 86.5
Rvp, psi: 7.9
RON, clear: 64.6
MON, clear: 63.2
Paraffins, vol %: 93.1
Naphthenes, vol %: 6.2
Aromatics, vol %: 0.7

Naphtha
Range, °F.: 158-212
Yield, vol %: 3.5
Gravity, °API: 67.0
Total sulfur, wt %: 0.0002
P/N/A, vol %: 63.7/32.0/4.3

Heavy naphtha
Range, °F.: 212-302
Yield, vol %: 7.3
Gravity, °API: 59.4
Total sulfur, wt %: 0.0004
P/N/A vol %: 69.2/18.6/12.2

Kerosine
Range, °F.: 302-401
Yield, vol %: 8.8
Gravity, °API: 52.4
Total sulfur, wt %: 0.0024
Smoke point, mm: 37
Freeze pt, °F.: —67
Cloud pt, °F.: —70
Pour pt, °F.: —75
Aniline pt, °F.: 148.4
Diesel index: 78
Aromatics, vol %: 8.5
Vis., cSt @ 100° F.: 1.08
@ 210° F.: 0.59

Middle distillate
Range, °F.: 401-509
Yield, vol %: 10.8
Gravity °API: 44.6
Total sulfur, wt %: 0.0081
Aniline pt, °F.: 163.9
Diesel index: 73
Cetane index: 59
Cloud pt, °F.: —4
Pour pt, °F.: —10
Vis., cSt @ 100° F.: 1.89
@ 212° F.: 0.88

Middle distillate
Range, °F.: 401-650
Yield, vol %: 25.8
Gravity, °API: 41.7
Total sulfur, wt %: 0.0191
Aniline pt, °F.: 176.8
Diesel index: 74
Cetane index: 65
Cloud pt, °F.: 38
Pour pt, °F.: 35
Vis., cSt @ 212° F.: 1.21

Gas oil
Range, °F.: 650-1,049
Yield, vol %: 34.7
Gravity, °API: 31.5
Total sulfur, wt %: 0.061
Aniline pt, °F.: 221.3
Con. carbon, wt %: 0.14
Pour pt, °F.: 105
Vis., cSt @ 212° F.: 5.03
V/Ni/Fe, wt ppm: 0.13/0.03/0.18

Residue
Range, °F.: 1,049+
Yield, vol %: 14.4
Gravity °API: 18.7
Total sulfur, wt %: 0.15
Con. carbon, wt %: 9.3
Vis., cSt @ 212° F.: 150
V/Ni/Fe, wt ppm: 0.95/4.20/16.50

Beryl, U.K. North Sea

SBM in producing area

Crude
Gravity, °API: 36.5
Kin. vis., cSt @ 59° F.: 9.47
Con. carbon residue, wt %: 1.3
Sulfur, wt %: 0.42
Rvp, psi: 5.2
V/Ni, ppm: 3.7/0.8
C_5 & lighter, vol %: 4.27

Naphtha
Range (TBP), °F.: 60-120
Yield, vol %: 2.29
Rvp, psi: 17.5
Paraffins, vol %: 97.5
Naphthenes, vol %: 2.5
Aromatics, vol %: 0.0
RON, clear: 80.5

Naphtha
Range, °F.: 120-330
Yield, vol %: 21.89
Sp gr, 60°/60° F.: 0.7519
Rvp, psi: 2.5
P/N/A, vol %: 48.7/33.8/17.6
RON, clear: 61.4
RON + 3 ml TEL: 81.6
Sulfur, wt %: 0.0014
Nitrogen, ppm: 2.2

Kerosine
Range, °F.: 330-425
Yield, vol %: 10.70
Sp gr: 0.7976
P/N/A, vol %: 42.5/36.4/21.1
Sulfur, wt %: 0.0168

Light gas oil
Range, °F.: 425-650
Yield, vol %: 24.75
Sp gr: 0.8441
Gravity, °API: 36.1
Pour pt, °F.: 5
Aniline pt, °F.: 155.5
Diesel index: 56
Cetane index: 51
Sulfur, wt %: 0.21

Heavy gas oil
Range, °F.: 650-995
Yield, vol %: 25.89
Gravity, °API: 26.1
Sp gr: 0.8981
Pour pt, °F.: 95
Kin. vis., cSt @ 100° F.: 38 [illegible]
Aniline pt, °F.: 190.8
Total nitrogen, ppm: 1,317

Residue
Range, °F.: 995+
Yield, vol %: 12.95
Gravity, °API: 14.4
Sp gr, 60/60° F.: 0.9698
Pour pt, °F.: 120
Kin. vis., cSt @ 100° F.: 14,827.95
Sulfur, wt %: 1.04
Con. carbon, wt %: 8.80
V/Ni, ppm: 24.0/5.7

Residue
Range, °F.: 650+
Yield, vol %: 38.85
Gravity, °API: 22.0
Sp gr: 0.9220
Pour pt, °F.: 100
Kin. vis., cSt @ 100° F.: 190.47
Sulfur, wt %: 0.78
Total nitrogen, ppm: 2,258
Con. carbon, wt %: 3.14
V/Ni, ppm: 8.4/2.0

Brae, U.K. North Sea

Scheduled to join Forties system in mid 1983

Crude
Gravity, °API: 33.6
Sulfur, wt %: 0.73
Vis., cSt @ 10° C.: 13.6
Pour pt., °C.: —6
Carbon residue, wt %: 2.3
Asphaltenes, wt %: 0.35
V/Ni, ppm wt: 2.5/0.4
C_1—C_4, wt %: 2.15

Gasoline
Range (TBP), °C.: C_5—95
Yield, vol %: 9.25
Density @ 15° C., kg/l: 0.6985

Naphtha
Range, °C.: C_5—149
Yield, vol %: 21.45
Density @ 15° C., kg/l: 0.7405
Sulfur, wt %: 0.0005
P/N/A, wt %: 51.4/30.9/25.6

Kerosine
Range, °C.: 149-232
Yield, vol %: 15.2
Density @ 15° C., kg/l: 0.8125
Sulfur, wt %: 0.034
Aromatics, vol %: 25.7
Smoke pt, mm: 21
Cold test, °C.: —62
Aniline pt, °C.: 45.5
Diesel index: 49
Cetane index: 40

Gas oil
Range, °C.: 232-342
Yield, vol %: 21.3
Density @ 15° C., kg/l: 0.864
Sulfur, wt %: 0.55
Cloud pt, °C.: —15
Pour pt, °C.: —18
Acidity, mg KOH/g: 0.02
Aniline pt, °C.: 60.6
Diesel index: 45
Cetane index: 47

Residue
Range, °C.: 342+
Yield, vol %: 39.3
Density @ 15° C., kg/l: 0.9435
Sulfur, wt %: 1.41
Vis., cSt @ 50° C.: 128
Pour pt, °C.: 36
Carbon residue, wt %: 5.5
Asphaltenes, wt %: 0.75
V/Ni, ppm wt: 6.5/0.9

F.C.C. feed
Range, °C.: 369-509
Yield, vol %: 20.55
Density @ 15° C., kg/l: 0.921
Vis., cSt @ 100° C.: 7.22
Wax, wt %: 14
Aniline pt, °C.: 79.2

Note: Assay run on preproduction crude sample.

Brent, U.K. North Sea

Brent system to Sullom Voe and SPAR in producing area

Crude
Gravity, °API @ 60° F.: 38.16
Sulfur, wt %: 0.26
Wax, wt %: 6.5
Pour pt (ASTM max.), °C.: —3
Kin. vis., @ 40° C., cSt: 3.72
H_2S existent/potential, ppm: <1/<1
Acid value, mg KOH/g (TAN): 0.05
Rvp, lb: 8.5
C_4—, vol %: 3.2

Gasoline
Range, °C.: C_5—85
Yield, vol %: 7.5
Sp gr @ 15° C.: 0.692
RON, clear: 71
RON + 0.5 g Pb/l Pb: 85

Naphtha
Range, °C.: 85-165
Yield, vol %: 17.7
Sp gr @ 15° C.: 0.769
Sulfur, wt %: 0.003
P/N/A, wt %: 42/34/24

Kerosine
Range, °C.: 165-235
Yield, vol %: 13.5
Sp gr @ 15° C.: 0.806
Sulfur, wt %: 0.01
Smoke pt, mm: 23
Aromatics, vol %: 21

Gas oil
Range, °C.: 235-300
Yield, vol %: 12.9
Sp gr @ 15° C.: 0.840
Sulfur, wt %: 0.05
Cetane index: 52
Cloud pt, °C.: —19

Gas oil
Range, °C.: 300-350
Yield, vol %: 9.2
Sp gr @ 15° C.: 0.860
Sulfur, wt %: 0.25
Cetane index: 57.5
Cloud pt, °C.: +6
Kin. vis., cSt @ 40° C.: 6.36

Residue
Range, °C.: 350+
Yield, vol %: 36.5
Sp gr @ 15° C.: 0.913
Sulfur, wt %: 0.55
Wax, wt %: 13
Pour pt, °C.: +36
Kin. vis., cSt @ 40° C.: 51.8
 @ 100° C.: 13.5
Acid value 0.08
Asphaltenes, wt %: 0.05
V/Ni, ppm: 4/1.5

Note: This is assay of unblended Brent crude loaded at offshore SPAR.

Brent Blend, U.K. North Sea

Sullom Voe Terminal, Shetlands

Crude
Gravity, °API: 38.0
Vis., cSt @ 20° C.: 5.67
 @ 37.8° C: 3.64
Pour pt, °C.: —15
Rvp, psig: 12.8
Sulfur, wt %: 0.38
Wax, wt %: 5.2
Asphaltenes, wt %: 0.26
V/Ni/Fe, ppm: 3.8/0.80/0.10

Light naphtha
Range, °C.: C_5—75
Yield, vol %: 6.2
Gravity, °API: 78.3
RON, clear: 72.0
Paraffins, wt %: 79.2
Olefins, wt %: Nil
Naphthenes, wt %: 16.8
Aromatics, wt %: 4.0

Naphtha
Range, °C.: C_5—165
Yield, vol %: 24.5
Gravity, °API: 60.1
Sulfur, ppm: 15
P/O/N/A, wt %: 59.0/Nil/33.0/8.0

Kerosine
Range, °C.: 165-235
Yield, vol %: 12.6
Gravity, °API: 45.0
Sulfur, wt %: 0.043
Smoke pt, mm: 26
Freeze pt, °C.: —56
Aromatics, vol %: 17.9

Gas oil
Range, °C.: 165-350
Yield, vol %: 33.3
Gravity, °API: 39.1
Sulfur, wt %: 0.14
Cetane index: 53.0
Pour pt, °C.: —21
Vis., cSt @ 37.8° C.: 2.37
 @ 50° C.: 1.92
Aniline pt, °C.: 66.8

Gas oil
Range, °C.: 235-350
Yield, vol %: 20.7
Gravity, °API: 35.7
Sulfur, wt %: 0.19
Cetane index: 54.0
Pour pt, °C.: —12
Vis., cSt @ 37.8° C.: 3.79
 @ 50° C.: 2.94
Aniline pt, °C.: 71.4

Vaccum gas oil
Range, °C.: 350-550
Yield, vol %: 28.3
Gravity, °API: 26.1
Sulfur, wt %: 0.57
Vis., cSt @ 100° F.: too waxy
Pour pt, °C.: +39
Con. carbon, wt %: 0.29
V/Ni/Fe, ppm: 0.05/0.02/0.14
UOP K factor: 12.3

Residue
Range, °C.: 550+
Yield, vol %: 10.3
Gravity, °API: 11.5
Sulfur, wt %: 1.35
Vis., cSt @ 37.8° C.: too waxy
Wax content, wt %: 10.1
Pour pt, °C.: +42
Con. carbon, wt %: 15.7
V/Ni/Fe, ppm: 25/5.7/0.96

Note: Analysis run on sample from tanker at Sullom Voe mid October 1981. Contributors to Brent Blend in early 1983 were North and South Cormorant, Brent, Dunlin, Thistle, and Murchison.

Buchan, U.K. North Sea

CALM in producing area

Crude
Gravity, °API: 33.7
Sulfur, wt %: 0.84
Vis., cSt @ 20° C.: 20.37
Pour pt, °C.: 6
Carbon residue, wt %: 5.0
Total C_1—C_4, yield, wt %: 1.50
V/Ni, ppm wt %: 19/4

Gasoline
Range (TBP), °C.: C_5—95
Yield, vol %: 9.45
Paraffins, wt %: 71.2
Naphthenes, wt %: 24.5
Aromatics, wt %: 4.3

Naphtha
Range, °C: C_5—149
Yield, vol %: 19.9
Sulfur, wt %: 0.0009
P/N/A, wt %: 58.1/31.9/10.0

Kerosine
Range, °C.: 149-232
Yield, vol %: 14.45
Density @ 15° C., kg/l: 0.7965
Sulfur, wt %: 0.037
Aromatics, vol %: 18.8
Smoke pt, mm: 24
Aniline pt, °C.: 54.9
Diesel index: 60
Cetane index: 45

Gas oil
Range, °C.: 232-342
Yield, vol %: 20.55
Density @ 15° C., kg/l: 0.8465
Sulfur, wt %: 0.43
Vis., cSt @ 50° C.: 2.72
Pour pt, °C: —15
Aniline pt, °C: 68.0
Diesel index: 55
Cetane index: 54

Gas oil
Range, °C: 342-369
Yield, vol %: 4.2
Sulfur, wt %: 0.93
Pour pt, °C.: 15
Aniline, pt, °C.: 74.9
Diesel index: 50
Cetane index: 57

Gas oil
Range, °C.: 369-509
Yield, vol %: 20.15
Density @ 15° C., kg/l: 0.9055
Sulfur, wt %: 1.06
Vis., cSt @ 60° C.: 21.1
@ 100° C.: 6.76
Wax, wt %: 12.5
Aniline pt, °C.: 84.6

Residue
Range, °C.: 342+
Yield, vol %: 43.25
Density @ 15° C., kg/l: 0.950
Sulfur, wt %: 1.56
Vis., cSt @ 50° C.: 304
Pour pt, °C.: 36
Carbon residue, wt %: 10.5
V/Ni, wt ppm: 39/8
V/Ni, wt ppm: (509+ °C.): 84/18
Sulfur, wt % (509+ °C.): 2.17

Cormorant, North, U.K. North Sea

Brent system to Sullom Voe

Crude
Gravity, °API: 34.9
Density @ 15° C., kg/l: 0.850
Sulfur, wt %: 0.71
Pour pt, °C.: +12
Kin. vis., @ 40° C., sq mm/sec: 5.76
Acid value, mg KOH/g (TAN): <0.05
C_4—, vol %: 2.6

Gasoline
Range, °C.: C_5—85
Yield, vol %: 7.0
Density @ 15° C.: 0.677
RON, clear: 69
RON + 0.5 g Pb/l: 84

Naphtha
Range, °C.: 85-165
Yield, vol %: 14.5
Density @ 15° C.: 0.759
Paraffins, wt %: 49
Naphthenes, wt %: 39
Aromatics, wt %: 20

Kerosine
Range, °C.: 165-235
Yield, vol %: 11.7
Density @ 15° C: 0.804
Sulfur, wt %: 0.04
Smoke pt, mm: 24
Aromatics, vol %: 20

Gas oil
Range, °C.: 235-300
Yield, vol %: 12.5
Density @ 15° C.: 0.837
Sulfur, wt %: 0.24
Cetane index: 53
Cloud pt, °C.: —23

Gas oil
Range, °C: 300-350
Yield, vol %: 9.4
Density @ 15° C.: 0.860
Sulfur, wt %: 0.56
Cetane index: 58
Cloud pt, °C.: +8
Kin. vis., @ 40° C., sq mm/sec: 5.92

Residue
Range, °C.: 350+
Yield, vol %: 42.7
Density @ 15° C.: 0.916
Sulfur, wt %: 0.56
Wax, wt %: 12
Pour pt, °C.: +36
Kin. vis., @ 60° C., sq mm/sec: 101
@ 100° C.: 20.0
Acid value: 0.05
Asphaltenes, wt %: 0.66
Con. carbon, wt %: 5.4
V/Ni, ppm: 23/11

Note: This was designated a provisional assay in early 1983.

Cormorant, South (Cormorant "A"), U.K. North Sea

Brent system to Sullom Voe

Crude
Gravity, °API: 35.7
Density @ 15° C. (kg/l): 0.846
Sulfur, wt %: 0.56
Pour pt, °C.: —6
Kin. vis., @ 40° C. sq mm/sec: 5.0
Acid value, mg KOH/g (TAN): 0.05
C_4—, vol %: 2.8

Gasoline
Range, °C.: C_5—85
Yield, vol %: 7.5
Density @ 15° C.: 0.679
RON, clear: 71
RON + 0.5 g Pb/l: 85

Naphtha
Range, °C.: 85-165
Yield, vol %: 15.4
Density @ 15° C.: 0.764
Sulfur, wt %: 0.001
Paraffins, wt %: 44
Naphthenes, wt %: 39
Aromatics, wt %: 17

Kerosine
Range, °C.: 165-235
Yield, vol %: 12.9
Density @ 15° C.: 0.806
Sulfur, wt %: 0.03
Smoke pt, mm: 21
Aromatics, vol %: 21

Gas oil
Range, °C.: 235-300
Yield, vol %: 13.4
Density @ 15° C.: 0.840
Sulfur, wt %: 0.16
Cetane index: 51.5
Cloud pt, °C.: —18

Gas oil
Range, °C.: 300-350
Yield, vol %: 7.9
Density @ 15° C.: 0.863
Sulfur, wt %: 0.49
Cetane index: 52
Cloud pt, °C.: +5
Kin. vis., @ 40° C., sq mm/sec: 6.27

Residue
Range, °C.: 350+
Yield, vol %: 40.5
Density @ 15° C.: 0.931
Sulfur, wt %: 1.06
Wax, wt %: 10
Pour pt, °C.: 36
Kin. vis., @ 60° C., sq mm/sec.: 81.1
@ 100° C.: 16.1
Acid value: 0.1
Asphaltenes, wt %: 0.55
V/Ni, ppm: 3/21

Dan, Denmark North Sea

Contributor to Gorm Blend

Crude
Gravity, °API: 30.4
Sulfur, wt %: 0.34
Vis., cSt @ 40° C.: 8.90
Pour pt, °F.: <-45
C_4 & lighter, vol %: 0.8

Light gasoline
Range, °F.: C_5—200
Yield, vol %: 5.8%
Density, kg/l: 0.714
Sulfur, wt %: 0.002
RON, clear: 80.0

Naphtha
Range, °F.: 200-405
Yield, vol %: 20.3
Density, kg/l: 0.791
Sulfur, wt %: 0.05
RON, clear: 63.7

Light gas oil
Range, °F.: 405-650
Yield, vol %: 26.6
Density, kg/l: 0.868
Sulfur, wt %: 0.19
Pour pt, °F.: —45

Heavy gas oil
Range, °F.: 650-1,000
Yield, vol %: 30.0
Density, kg/l: 0.920
Sulfur, wt %: 0.42
Pour pt, °F.: 60
Vis., cSt @ 50° C.: 44.2

Atmospheric resid
Range, °F.: 650+
Yield, vol %: 46.5

Density, kg/l: 0.942
Sulfur, wt %: 0.55
Pour pt, °F.: 45
Vis., cSt @ 50° C.: 269
Carbon residue, wt %: 5.0

Vacuum residue
Range, °F.: 1,000+
Yield, vol %: 16.5
Density, kg/l: 0.977
Sulfur, wt %: 0.70
Pour pt, °F.: 100
Vis., cSt @ 100° C.: 326

Dunlin, U.K. North Sea

Brent system to Sullom Voe

Crude
Gravity, °API @ 60° F.: 34.9
Sulfur, wt %: 0.39
Wax, wt %: 5.0
Pour pt (ASTM max.), °C.: +6
Kin. vis., cSt @ 40° C.: 4.92
C_4—, vol %: 2.3

Gasoline
Range, °C.: C_5—85
Yield, vol %: 6.8
Sp gr @ 15° C.: 0.682
RON, clear: 69

Naphtha
Range, °C.: 85-165
Yield, vol %: 15.2
Sp gr @ 15° C.: 0.761
P/N/A, wt %: 42/43/15

Kerosine
Range, °C.: 165-235
Yield, vol %: 11.8
Sp gr @ 15° C.: 0.809
Sulfur, wt %: 0.025
Smoke pt, mm: 22
Aromatics, vol %: 21

Gas oil
Range, °C.: 235-300
Yield, vol %: 13.0
Sp gr @ 15° C.: 0.846
Sulfur, wt %: 0.13
Cetane index: 50
Cloud pt, °C.: —25

Gas oil
Range, °C.: 300-350
Yield, vol %: 10.0
Sp gr @ 15° C.: 0.864
Sulfur, wt %: 0.32
Cetane index: 56
Cloud pt, °C.: —1
Kin. vis., cSt @ 40° C.: 6.3

Residue
Range, °C.: 350+
Yield, vol %: 41.2
Sp gr @ 15° C.: 0.930
Sulfur, wt %: 0.74
Wax, wt %: 10
Pour pt, °C.: +33
Vis. kin., cSt @ 60° C.: 82.4
@ 100° C.: 18.3
Acid value: 0.2
Asphaltenes, wt %: 0.24
V/Ni, ppm wt %: 5/2

Ekofisk, Norway North Sea

Seal Sands, Teesside, U.K. terminal

Crude
Gravity, °API: 43.4
Sulfur, wt %: 0.14
Pour pt, °F.: 10
Vis., SUS @ 70° F.: 36.1
Rvp, psig: 5.0
Yield, C_1—C_5, wt %: 6.43

Gasoline
Range, °F.: Ibp—176
Yield, vol %: 11.9
RON, clear: 66

Naphtha
Range, °F.: 176-302
Yield, vol %: 20.2
Gravity, °API: 57.9
Paraffins, vol %: 53.1
Naphthenes, vol %: 36.8
Aromatics, vol %: 10.1
Sulfur, ppm: 3

Kerosine
Range, °F.: 302-400
Yield, vol %: 10.6
Gravity, °API: 48.7
Total sulfur, wt %: 0.002
Aniline pt, °F.: 137
Smoke pt, °F.: 23
Freezing pt, °F.: —85

Gas oil
Range, °F.: 400-662
Yield, vol %: 23.4
Gravity, °API: 38.0
Vis., cSt @ 100° F.: 3.01
Pour pt, °F.: 0
Aromatics, vol %: 17
Total sulfur, wt %: 0.07
Aniline pt, °F.: 162
Diesel index: 62

Gas oil
Range, °F.: 302-707
Yield, vol %: 37.3
Gravity, °API: 40.2
Pour pt, °F.: 5

Heavy gas oil
Range, °F.: 707-977
Yield, vol %: 13.2
Gravity, °API: 25.0
Vis., cSt @ 122° F.: 34.05
Pour pt, °F.: 97
Total sulfur, wt %: 0.25
Con. carbon, wt %: 0.047
Aniline, °F.: 200.5
V/Ni/Fe, ppm: 0.8/0.3/0.3

Residue
Range, °F.: 707+
Yield, vol %: 25.2
Gravity, °API: 20.9
Vis., SUS @ 212° F.: 117.2
Pour pt, °F.: 97
Sulfur, wt %: 0.40
Con. carbon, wt %: 4.3
V/Ni/Fe, ppm: 0.4/5.7/1.2

Note: Seven fields contribute to the Ekofisk Blend, which this assay represents. They are Ekofisk, West Ekofisk, Cod (pure gas condensate), Tor, Eldfisk, Edda, and Albuskjell. Condensate is not included in gasoline and naphtha blends listed.

Flotta, U.K. North Sea

Flotta terminal, Orkney Islands

Crude
Gravity, °API: 35.7
Sulfur, wt %: 1.14
Vis., cSt @ 40° F.: 30.8
@ 104° F.: 4.38
Pour pt, °F.: 21.0
C_4 & lighter, vol %: 4.3
Rvp @ 100° F., psi: 9.1

Naphtha
Range, °F.: C_5-149
Yield, vol %: 5.0
Sulfur, wt %: 0.001
Paraffins, vol %: 94.5
Naphthenes, vol %: 3.5
Aromatics, vol %: 1.5
RON, clear: 73.0
RON + 0.4 g Pb/l: 86.0
Rvp @ 100° F., psi: 18.2

Naphtha
Range, °F.: 149-302
Yield, vol %: 14.9
Gravity, °API: 59.9
Sulfur, wt %: 0.001
P/N/A, vol %: 66.0/27.5/16.0
RON, clear: 58.0

Naphtha
Range, °F.: 302-356
Yield, vol %: 5.6
Gravity, °API: 50.0
Sulfur, wt %: 0.04
Rvp @ 100° F., psi: 0.6
P/N/A, vol %: 49.5/30.5/19.5
Smoke pt, mm: 23
Freeze pt, °F.: −76

Kerosine
Range, °F.: 356-455
Yield, vol %: 8.0
Gravity, °API: 44.1
Sulfur, wt %: 0.11
Vis., cSt @ 104° F.: 1.23
Aromatics, vol %: 23.0
Smoke pt, mm: 20.5
Freeze pt, °F.: −48
Aniline pt, °F.: 129
Cloud pt, °F.: −66

Gas oil
Range, °F.: 455-572
Yield, vol %: 11.8
Gravity, °API: 37.0
Sulfur, wt %: 0.51
Vis., cSt @ 104° F.: 2.3
Aromatics, vol %: 28.0
Aniline pt, °F.: 141
Cloud pt, °F.: −10

Gas oil
Range, °F.: 572-650
Yield, vol %: 8.4
Gravity, °API: 32.5
Sulfur, wt %: 1.05
Vis., cSt @ 104° F: 4.78
Aromatics, vol %: 36.0
Aniline pt, °F.: 157
Cloud pt, °F.: 29

Gas oil
Range, °F.: 650-1,000
Yield, vol %: 28.5
Gravity, °API: 23.2
Sulfur, wt %: 1.69
Vis., cSt @ 122° F.: 25.8
Pour pt, °F.: 91
Aniline, pt °F.: 171
Con. carbon residue, wt %: 0.29
V/Ni/Fe, ppm: <1/1/2

Residue
Range, °F.: 650+
Yield, vol %: 42.0
Gravity, °API: 18.3
Sulfur wt %: 2.08
Vis., cSt @ 104° F.: 220
@ 122° F.: 127
Pour pt, °F.: 86
Aniline pt °F.: 173
Con. carbon, wt %: 5.9
V/Ni/Fe: <3/7/3

Note: Flotta is a blend made up of Piper, Claymore, and Tartan crudes. Tartan appears in this section while Piper and Flotta (before introduction of Tartan) are in OGJ, Dec. 3, 1979, p. 102.

Forties, U.K. North Sea

Hound Point terminal, Firth of Forth

Crude
Gravity, °API: 36.6
Sulfur, wt %: 0.30
Vis., cSt @ 10° C.: 9.6
@ 21.1° C.: 6.81
Pour pt, °C.: −3
Wax, wt %: 7.0
Carbon residue, wt %: 2.2
Asphaltenes, wt %: 0.2
V/Ni, ppm wt: 3/2
Watson K factor: 11.9
C_1-C_4, wt %: 2.74

Gasoline
Range (TBP), °C.: C_5-95
Yield, vol %: 9.23
Sulfur, wt %: <0.001
RON, clear: 69.5
RON + 0.44 ml TEL/l: 83
P/N/A, wt %: 71.1/25.7/3.2

Naphtha
Range, °C.: C_5-149
Yield, vol %: 20.02
Density @ 15° C., kg/l: 0.723
Sulfur, wt %: <0.001
RON, clear: 62
RON + 0.44 ml TEL/l: 77.5
P/N/A, wt %: 54.9/35.8/9.3

Kerosine
Range, °C.: 149-232
Yield, vol %: 14.50
Density @ 15° C., kg/l: 0.7995
Sulfur, wt %: 0.010
Aromatics, vol %: 19.5
Smoke pt, mm: 24
Cold test, °C.: −58
Aniline pt, °C.: 54
Diesel index: 59
Cetane index: 44

Gas oil
Range, °C.: 232-342
Yield, vol %: 20.92
Density @ 15° C., kg/l: 0.852
Sulfur, wt %: 0.14
Vis., cSt @ 37.8° C.: 3.5
@ 50° C.: 2.7
Cloud pt, °C.: −15
Pour pt, °C.: −15
Aniline pt, °C.: 67
Diesel index: 53
Cetane index: 52

Residue
Range, °C.: 342+
Yield, vol %: 40.96
Density @ 15° C., kg/l: 0.9265
Sulfur, wt %: 0.61
@ 50° C: 102
Pour pt, °C.: 33
Wax, wt %: 14.3
Carbon residue, wt %: 4.8
Asphaltenes, wt %: 0.5
V/Ni, ppm wt %: 7/4

FCC feed
Range, °C.: 369-509
Yield, vol %: 20.38
Density @ 15° C., kg/l: 0.9045
Sulfur, wt %: 0.44
Vis., cSt @ 37.8° C.: 45.6
Total nitrogen, ppm wt: 960
Aniline pt, °C.: 88

Note: Assay based on analyses of production crude samples obtained at rates of up to 400,000 b/d

Fulmar, U.K. North Sea

SBM in producing area

Crude
Gravity, °API: 39.3
Density @ 15° C., kg/l: 0.828
Sulfur, wt %: 0.26
Pour pt, °C.: −12
Kin. vis., @ 40° C., sq mm/sec: 2.55
Acid value, mg KOH/g (TAN): 0.06
Yield C_4−, vol %: 2.7

Gasoline
Range, °C.: C_5-85
Yield, vol %: 19.5
Density @ 15° C.: 0.666
RON, clear: 71
RON + 0.5 g Pb/l: 85

Naphtha
Range, °C.: 85-165
Yield, vol %: 19.5
Density @ 15° C.: 0.757
Sulfur, wt %: 0.001
Paraffins, wt %: 55
Naphthenes, wt %: 26
Aromatics: 19

Kerosine
Range, °C.: 165-235
Yield, vol %: 15.7
Density @ 15° C.: 0.804
Sulfur, wt %: 0.02
Smoke pt: 23
Aromatics, vol %: 23

Gas oil
Range, °C.: 235-300
Yield, vol %: 12.2
Density @ 15° C.: 0.839
Sulfur, wt %: 0.06
Cetane index: 51.5

Gas oil
Range, °C.: 300-350
Yield, vol %: 9.5
Density @ 15° C.: 0.856
Sulfur, wt %: 0.26
Cetane index: 60
Cloud pt, °C.: +3
Kin. vis., @ 40° C., sq mm/sec: 5.70

Residue
Range, °C.: 350+
Yield, vol %: 33.1
Density @ 15° C.: 0.916
Sulfur, wt %: 0.56
Pour pt, °C.: +33
Kin. vis., @ 60° C., sq mm/sec: 44.1
@ 100° C.: 11.3
Acid value: 0.08
Asphaltenes, wt %: 1.8
V/Ni, ppm: 5/1

Note: This has been designated a tentative assay

Gorm, Denmark North Sea

SBM in producing area

Crude
Gravity, °API: 33.9
Sulfur, wt %: 0.23
Vis., cSt @ 40° C.: 5.44
Pour pt, °F.: −35
C_4 & lighter, vol %: 1.6

Light gasoline
Range, °F.: C_5-300
Yield, vol %: 19.7
Density, kg/l: 0.729
Sulfur, wt %: 0.001
P/N/A vol %: 53/40/7

Naphtha
Range, °F.: 300-400
Yield, vol %: 10.0
Density, kg/l 0.800
Sulfur, wt %: 0.026
Smoke pt, mm: 23
Freezing pt, °F.: <−94
Aniline pt, °F.: 120
P/N/A vol %: 32/47/21

Kerosine
Range, °F.: 400-500
Yield, vol %: 12.1
Density, kg/l: 0.841
Sulfur, wt %: 0.065
Smoke pt, mm: 16
Freezing pt, °F.: −47
Cloud pt, °F.: −50
Pour pt, °F.: −60
Aniline pt, °F.: 134

Diesel oil
Range °F.: 500-650
Yield, vol %: 15.9
Density, kg/l: 0.865
Sulfur, wt %: 0.16
Cloud pt, °F.: 16
Pour pt, °F.: 20
Aniline pt., °F.: 155

Gas oil
Range, °F: 650-815
Yield, vol %: 15.0
Density, kg/l: 0.903
Sulfur, wt %: 0.30
Nitrogen, wt %: 0.08
Pour pt, °F.: 70
Aniline pt., °F.: 176
Vis., cSt @ 50° C.: 19.9

Heavy gas oil
Range, °F.: 815-1,000
Yield, vol %: 10.8
Density, kg/l: 0.924
Sulfur, wt %: 0.37
Nitrogen, wt %: 0.18
Pour pt, °F.: 100
Aniline pt, °F.: 196
Vis cSt @ 50° C.: 110

Residuum
Range, °F: 1,000+
Yield, vol %: 14.9
Density, kg/l: 0.972
Sulfur, wt %: 0.59
Nitrogen, wt %: 0.60
Hydrogen, wt %: 11.2
Carbon residue, wt %: 9.6
Vis., cSt @ 100° C.: 300
V/Ni, ppm: 65/40

Note: Subsequent to this assay Gorm has been joined by crude from Dan field (13% of blend in late 1982) and Skjold field (6% of blend). Skjold is marginal field. Dan has gravity of 30.4° API & sulfur content of 0.34 wt %.

Gullfaks, Norway North Sea

Block 34/10—Not yet in production

Crude
Gravity, °API: 28.6
Sp gr, 60/60: 0.8838
Sulfur, wt %: 0.44
Pour pt, °F.: −50
Vis., cSt @ 100° F.: 10.14

Gasoline
Range, °C.: 20-70
Yield, wt %: 0.8
Sp gr, 60/60: 0.6948
Sulfur, wt ppm: 100
RON, clear: 82.9

Paraffins, wt %: 66
Naphthenes, wt %: 32.1
Aromatics, wt %: 1.9

Gasoline
Range, °C.: 70-100
Yield, wt %: 2.6
Sp gr, 60/60: 0.7433
Sulfur, wt ppm: 500
P/N/A, wt %: 34.8/58.3/6.9

Gasoline
Range, °C.: 100-150
Yield, wt %: 7.0
Sp gr, 60/60: 0.7808
Sulfur, wt %: 0.0023
P/N/A, wt %: 33/44.6/22.4
Yield, wt %: 7.0

Gasoline
Range °C.: 150-190
Yield, wt %: 6.6
Sp gr, 60/60: 0.8056
Sulfur, wt %: 0.0116
P/N/A, wt %: 42.5/32.3/25.2

Kerosine
Range, °C.: 150-205
Yield, wt %: 9.2
Sp gr, 60/60: 0.8108
Sulfur, wt %: 0.0148
Smoke pt, mm: 20
Diesel index: 48
Vis., cSt @ 100° F.: 1.03

Gas oil
Range, °C.: 205-343
Yield, wt %: 28.4
Sp gr, 60/60: 0.8676
Sulfur, wt %: 0.1935
Diesel index: 43
Vis., cSt @ 100° F.: 3.61

Residue
Range, °C.: 343+
Yield, wt %: 51.8
Gravity, °API: 19.3
Sp gr, 60/60: 0.9382
Sulfur, wt %: 0.77
Con. carbon, wt %: 3.8
Vis., cSt @ 100° F.: 351
Pour pt, °F.: 15

Note: This is a preliminary assay.

Magnus, U.K. North Sea

Ninian system to Sullom Voe (hookup slated mid 1983)

Crude
Gravity, °API: 39.3
Sulfur, wt %: 0.28
Pour pt, °C.: −3
Vis., cSt @ 21.1 °C.: 4.56
Carbon residue, wt %: 1.6
V/Ni, ppm wt %: 4/<2
Total C_1-C_4, wt %: 3.15

Gasoline
Range (TBP),°C.: C_5-95
Yield, wt %: 9.8

Naphtha
Range, °C.: 95-175
Yield, wt %: 16.75
P/N/A, wt %: 39.2/41.3/19.5

Naphtha
Range, °C.: C_5-149
Yield, wt %/vol %: 21.45/24.25
Density @ 15° C., kg/l: 0.733
Sulfur, wt %: 0.0015
P/N/A, wt %: 52.9/33.8/13.3

Kerosine
Range, °C.: 149-232
Yield, wt %/vol %: 15.0/15.5
Density @ 15 °C., kg/l: 0.8015
Sulfur, wt %: 0.0085
Acidity, mg KOH/g: 0.03
Aromatics, vol %: 19.9
Cold test, °C.: −53.5
Aniline pt, °C.: 54.2
Cetane index: 44

Gas oil
Range, °C.: 232-342
Yield, wt %/vol %: 21.4/20.9
Density @ 15° C., kg/l: 0.8485
Sulfur, wt %: 0.15
Pour pt, °C.: −15
Acidity, mg KOH/g: 0.05
Aniline pt, °C.: 68.0
Diesel index: 54
Cetane index: 53

Gas oil
Range, °C.: 342-369
Yield, wt %/vol %: 4.4/4.15
Density @ 15° C., kg/l: 0.8755
Sulfur, wt %: 0.39
Vis., cSt @ 50° C.: 6.85
Pour pt, °C.: 12
Aniline pt, °C.: 77.1
Diesel index: 51
Cetane index: 58

Gas oil
Range, °C.: 369-509
Yield, wt %/vol %: 21.15/19.45
Density @ 15° C., kg/l: 0.8995
Sulfur, wt %: 0.43
Vis., cSt @ 98.9° C.: 6.27
Wax, wt %: 17.5
Aniline pt, °C.: 89.1

Residue
Range, °C.: 342+
Yield, wt %/vol %: 39.0/35.15
Density @ 15° C., kg/l: 0.918
Sulfur, wt %: 0.57
Vis., cSt @ 50° C.: 69
Carbon residue, wt %: 4.5
Asphaltenes, wt %: 0.35
V/Ni, ppm wt: 11/4

Residue
Range, °C.: 509+
Yield, wt %/vol %: 13.45/11.55
Density @ 15° C., kg/l: 0.965
Sulfur, wt %: 0.80
Vis., cSt @ 98.9 °C.: 122
Carbon residue, wt %: 12.0
V/Ni, ppm wt %: 30/7

Note: Preliminary guide to Magnus, which was not in production when assay sample obtained.

Maureen, U.K. North Sea

Not yet in production. Production expected late 1983 or early 1984.

Crude
Gravity, °API @ 60° F.: 35.8/35.3*
Sulfur, wt %: 0.55
Pour test, °F.: +45
Vis., SUS @ 70° F.: 78.92/81.79*
C_4−, vol %: 2.6

Gasoline
Range, °F.: 60-200
Yield, vol %: 9.0
Sulfur, wt %: 0.002
RON, clear: 72.5
RON + 3 ml TEL/gal: 91.3

Naphtha
Range, °F.: 60-400
Yield, vol %: 27.9
P/N/A, vol %: 57.32/31.96/10.72
Sulfur, wt %: 0.002
RON, clear: 52.8
RON + 3 ml TEL/gal: 77.8

Kerosine
Range, °F.: 400-500
Yield, vol %: 12.3
Gravity, °API: 39.7
Vis., SUS @ 100° F.: 32.15
Freeze pt, °F.: −42
P/N/A, vol %: 37.8/40.1/22.1
Sulfur, wt %: 0.05
Aniline pt, °F.: 141.0
Smoke pt, mm: 20

Gas oil
Range, °F.: 500-650
Yield, vol %: 15.6
Gravity, °API: 34.0
Vis., SUS @ 100° F.: 42.34
Pour pt, °F.: +20
P/N/A, vol %: 34.3/39.8/25.9
Sulfur, wt %: 0.17
Aniline pt, °F.: 163.3
Cetane index: 55.5

Topped crude
Range, °F.: 650+
Yield, vol %: 41.6
Gravity, °API: 19.8
Vis., SUS @ 210° F.: 101.05
Pour pt, °F.: +90
Sulfur, wt %: 0.64
Rams. car. residue, wt %: 5.07
V/Ni, ppm 9.5/4.5

Note: The inspection of fractions is based on composite of three drillstem test samples.
* Results from two samples.

Montrose, U.K. North Sea

SBM in producing area

Crude
Gravity, °API: 40.1
Sulfur, wt %: 0.23
Rvp, psi: 4.0
Pour pt, °F.: 15
Neut. no., mg KOH/g: 0.28
Rams. carbon, wt %: 1.3
Vis kin., cSt @ 68° F.: 4.96
@ 100° F.: 3.27
V/Ni, ppm: 2/2
C_4−, vol %: 2.2

Gasoline
Range (TBP), °F.: C_5-200
Yield, vol %: 12.3
Sulfur, wt %: 0.002
P/N/A, vol %: 70.0/27.1/2.9
RON, clear: 71.4
RON + 3 cc TEL/gal: 89.5

Naphtha
Range, °F.: 200-320
Yield, vol %: 15.0
Gravity, °API: 55.5
Sulfur, wt %: 0.001
Charac. factor: 11.84
P/N/A vol %: 56.2/33.5/10.3
RON, clear: 42.8
RON + 3 cc TEL/gal: 68.0

Kerosine
Range, °F.: 320-400
Yield, vol %: 8.9
Gravity, °API: 47.7
Sulfur, wt %: 0.005
Aniline pt, °F.: 137.7
Diesel index: 65.7

Cetane index: 45.1
Freeze pt., °F.: −75
Smoke pt., mm: 24

Gas oil
Range, °F.: 400-650
Yield, vol %: 25.4
Gravity, °API: 38.2
Sulfur, wt %: 0.082
Aniline pt., °F.: 161.1
Diesel index: 61.6
Cetane index: 55.1
Cloud pt., °F.: 10
Pour pt., °F.: 4
Vis., SUS @ 100° F.: 35.2
Total nitrogen, wt %: 0.009

Residue
Range, °F.: 650+
Yield, vol %: 36.6
Gravity, °API: 23.7
Sulfur, wt %: 0.5
Pour pt., °F.: 80
Total nitrogen, wt %: 0.136
Rams. carbon, wt %: 3.3
Vis., SUS @ 122° F.: 334.6
@ 210° F.: 67.1
V/Ni, ppm: 4/4

Murchison, U.K. & Norway, North Sea

Brent system to Sullom Voe terminal

Crude
Gravity, °API: 38.0
Kin. vis., @ 100° F.: 3.60
Con. carbon residue, wt %: 1.1
Sulfur, wt %: 0.27
V/Ni, ppm: 2.5/0.7
Pour pt., °C: +7.2
Rvp, psi: 9.0
C_4 & lighter, vol %: 3.0

Naphtha
Range (TBP), °F.: 86-375
Yield, vol %: 31.2
Paraffins, vol %: 55.5
Naphthenes, vol %: 32.8
Sulfur, wt %: <0.01

Kerosine
Range, °F.: 375-520
Yield, vol %: 13.5
Gravity, °API: 42.2
Sulfur, wt %: 0.02
Aromatics, vol %: 17

Heavy distillate
Range, °F.: 520-700
Yield, vol %: 21.4
Gravity, °API: 34.1
Sulfur, wt %: 0.16

Gas oil
Range, °F.: 700-1,020
Yield, vol %: 21.0
Gravity, °API: 25.8
Sulfur, wt %: 0.43

Residue
Range, °F.: 1,020+
Yield, vol %: 11.9
Gravity, °API: 13.7
Sulfur, wt %: 0.93
Kin. vis. @ 210° F.: 196
Con. carbon residue, wt %: 11.8
V/Ni, ppm: 18/5

Ninian Blend, U.K. North Sea

Ninian system to Sullom Voe terminal

Crude
Gravity °API: 35.6
Sulfur, wt %: 0.43
Vis., cSt @ 40° C.: 5.61
Pour pt., °F.: 35
C_4 & lighter, vol %: 2.6

Light gasoline
Range, °F.: C_5-300
Yield, vol %: 19.9
Density, kg/l: 0.726
Sulfur, wt %: 0.001
Paraffins, vol %: 63
Naphthenes, vol %: 27
Aromatics, vol %: 10

Naphtha
Range, °F.: 300-400
Yield, vol %: 9.3
Density kg/l: 0.788
Sulfur, wt %: 0.006
Smoke pt., mm: 27
Aniline pt., °F.: 128
P/N/A, vol %: 44/40/16

Kerosine
Range, °F.: 400-500
Yield, vol %: 11.1
Density, kg/l: 0.828
Sulfur, wt %: 0.047
Smoke pt., mm: 21
Freeze pt., °F.: −33
Cloud pt., °F.: −40
Pour pt., °F.: −40
Aniline pt., °F.: 143

Diesel oil
Range, °F.: 500-650
Yield, vol %: 14
Density, kg/l: 0.852
Sulfur, wt %: 0.23
Cloud pt., °F.: 20
Pour pt., °F.: 20
Aniline pt., °F.: 164

Gas oil
Range, °F.: 650-815
Yield, vol %: 13.1
Density, kg/l: 0.883
Sulfur, wt %: 0.46
Nitrogen, wt %: 0.05
Pour pt., °F.: 75
Aniline pt., °F.: 184
Vis., cSt @ 50° C.: 10.7

Heavy gas oil
Range, °F.: 815-1,000
Yield, vol %: 14.0
Density, kg/l: 0.906
Sulfur, wt %: 0.60
Nitrogen, wt %: 0.10
Pour pt., °F.: 110
Aniline pt., °F.: 205
Vis., cSt @ 50° C.: 71.3

Residue
Range, °F.: 1,000+
Yield, vol %: 16.0
Density, kg/l: 0.982
Sulfur, wt %: 1.2
Nitrogen, wt %: 0.40
Carbon residue, wt %: 11.7
Vis., cSt @ 100° C.: 291
V/Ni, ppm: 24/4

Note: This assay prepared when Heather field made up of 10% Ninian Blend. Magnus field is scheduled to contribute to Ninian system in mid 1983.

Statfjord, Norway & UK, North Sea

"A" and "B" SPM buoys in producing area

Crude
Gravity, °API: 38.4
Pour pt., °F.: 40
Kin. vis., @ 59° F.: 7.33
Con. carbon residue, wt %: 1.32
Sulfur, wt %: 0.27
Rvp, psi: 5.5
Total ~~nitrogen~~, ppm: 1.03
V/Ni, ppm: 0.53/1.03
C_5 & lighter, vol %: 5.08

Naphtha
Range (TBP), °F.: 60-100
Yield, vol %: 6.49
Sp gr, 60° F./60° F.: 0.6740
Rvp, psi: 10.3
Paraffins, vol %: 80.1
Naphthenes, vol %: 17.8
Aromatics, vol %: 2.1

Naphtha
Range, °F.: 100-360
Yield, vol %: 22.12
Sp gr 0.7603
P/N/A: 48.9/37.3/13.8
RON, clear: 51.3
RON +3 ml TEL: 74.2
Sulfur, wt %: 0.0037

Kerosine
Range, °F.: 360-503
Yield, vol %: 15.08
P/N/A, vol %: 48.1/34.6/17.2
Freeze pt., °F.: −47
Cloud pt., °F.: −52
Smoke pt., mm: 20
Aniline pt., °F: 142.1
Diesel index: 60
Cetane index: 49
Sulfur, wt %: 0.03

Light gas oil
Range, °F.: 503-710
Yield, vol %: 22.22
~~Sp gr, 60~~° F./60° F.: 0.8526
Gravity, °API: 34.5
Pour pt., °F.: 25
Aniline pt., °F.: 166

Heavy gas oil
Range, °F.: 710-946
Yield, vol %: 22.09
Gravity, °API: 25.6
Pour pt., °F.: 105
Kin. vis., cSt @ 100° F.: 66.27
Aniline pt., °F.: 200
Sulfur, wt %: 0.40
Basic nitrogen, ppm: 375
Con. carbon residue, wt %: 0.07

Residue
Range, °F.: 946+
Yield, vol %: 9.84
Gravity, °API: 14.2
Pour pt., °F.: 120
Kin. vis., cSt @ 100° F.: 24,732.61
Sulfur, wt %: 0.74
Total nitrogen, ppm: 1,750
Con. carbon, wt %: 10.58
V/Ni, ppm: 8.1/5.7

Note: This assay is on production from Statfjord "A" platform. Statfjord "B" began operation in November 1982.

Tartan, U.K. North Sea

Flotta system

Crude
Gravity, °API: 41.7
Sulfur, wt %: 0.56
Vis., cSt @ 40° F: 11.6
Pour pt, °F: 16
C_4 & lighter, vol %: 3.5
Rvp @ 100° F, psi: 10.2

Naphtha
Range, °F: C_5-149
Yield, vol %: 5.7
Sulfur, wt %: 0.001
Paraffins, vol %: 97.0
Naphthenes, vol %: 1.5
Aromatics, vol %: 1.0
RON, clear: 70.2

Naphtha
Range, °F: 149-302
Yield, vol %: 20.0
Gravity, °API: 58.5
Sulfur, wt %: 0.01
P/N/A, vol %: 56.5/25.5/17.5
RON, clear: 56.6

Naphtha
Range, °F: 302-356
Yield, vol %: 7.1
Gravity, °API: 49.4
Sulfur, wt %: 0.06
P/N/A, vol %: 50/30/19.5

Kerosine
Range, °F: 356-455
Yield, vol %: 10.8
Gravity, °API: 44.0
Sulfur, wt %: 0.1
Aromatics, vol %: 23.5
Smoke pt, mm: 20
Freeze pt, °F: −52
Aniline pt, °F: 135

Gas oil
Range, °F: 455-572
Yield, vol %: 12.3
Gravity, °API: 37.3
Sulfur, wt %: 0.32
Aromatics, vol %: 28.0
Aniline pt, °F: 149

Gas oil
Range, °F: 572-650
Yield, vol %: 8.3
Gravity, °API: 34.0
Sulfur, wt %: 0.64
Aromatics, vol %: 32.0
Aniline pt, °F: 167

Residue
Range, °F: 650+
Yield, vol %: 32.3
Gravity, °API: 23.1
Sulfur, wt %: 1.22
Vis., cSt @ 122° F: 55.5
Con. carbon residue, wt %: 2.5
V/Ni/Fe, ppm: 6.0/2.0/4.0

Note: Tartan is part of Flotta Blend.

Thistle, U.K. North Sea

Brent system to Sullom Voe terminal

Crude
Gravity, °API: 37.03
Vis., cSt @ 20° C: 5.87
  @ 37.8° C: 4.26
Pour pt, °C: 12
Rvp, psig: 7.5
H_2S, wt %: <0.01
Acid no., mg KOH/g: <0.05
Sulfur, wt %: 0.31
Wax, wt %: 7.7
Asphaltenes, wt %: 0.19
C_4—, wt % on crude (GLC): 0.69

Gasoline
Range, °C: C_5-85
Yield, vol %/wt %: 7.0/5.6
Density @ 15° C., g/cc: 0.6771
Sulfur, wt %: <0.01
RON, clear/0.5 g TEL per liter: 71.6/84.7
PO/N/A, wt %: 64.0/Nil/25/11.0

Naphtha
Range, °C: 85-165
Yield, vol %/wt %: 16.6/15.0
Density @ 15° C., g/cc: 0.7547
Sulfur, wt %: <0.01
P/O/N/A, wt %: 44.5/Nil/42.9/12.6

Kerosine
Range, °C: 165-235
Yield, vol %/wt %: 12.6/11.9
Density @ 15° C., g/cc: 0.7984
Sulfur, wt %: 0.02
Smoke pt, mm: 24
Freeze pt, °C: −51
Aniline pt, °C: 58.7
Aromatics, vol %: 15.0

Light gas oil
Range, °C: 235-300
Yield, vol %/wt %: 12.9/12.9
Density @ 15° C., g/cc: 0.8393
Sulfur, wt %: 0.06
Vis., cSt @ 37.8° C: 2.46
Cetane index: 49.5
Pour pt, °C: −24
Cloud pt, °C: −22
Aniline pt, °C: 65.9
Con. car. residue (on 10% residue), wt %: 0.004

Heavy gas oil
Range, °C: 300-350
Yield, vol %/wt %: 9.6/9.8
Density @ 15° C., g/cc: 0.8494
Sulfur, wt %: 0.21
Vis., cSt @ 37.8° C: 5.47
Cetane index: 58.5
Pour pt, °C: 0
Cloud pt, °C: 1
Aniline pt, °C: 77.9
Con. car. residue (on 10% residue), wt %: 0.039

Residue
Range, °C: 350+
Yield, vol %/wt %: 39.8/43.8
Density @ 15° C., g/cc: 0.9217
Sulfur, wt %: 0.63
Vis., cSt @ 98.9° C: 14.77
Pour pt, °C: 39
Asphaltenes, wt %: 0.95
Con. car. residue, wt %: 4.6
V/Ni, ppm: 7.5/1.9
-30

West African

Bonny Light, Nigeria

Bonny shore terminal and Bonny marine SBM (12 miles offshore in Atlantic)

Crude
Gravity, °API: 36.7
Sulfur, wt %: 0.12
Salt, lb/1,000 bbl: 12
Wax, wt %: 7.5
Carbon residue, wt %: 1.0
V/Ni, ppm wt: <2/3
Vis., cSt @ 37.8° C: 3.47
Yield C_1—C_4, wt %: 2.10

Naphtha
Range (TBP), °C: C_5—149
Yield, vol %: 20.85
Sulfur, wt %: 0.002
Watson K factor: 12.2
RON, clear: 68.5
RON + 0.44 ml TEL/l: 81.5
Paraffins, wt %: 42.6
Naphthenes, wt %: 47.6
Aromatics, wt %: 9.8

Kerosine
Range, °C: 149—232
Yield, vol %: 16.8
Sulfur, wt %: 0.020
Aromatics, vol %: 17
Smoke pt, mm: 21
Freeze pt, °C: −61
Aniline pt, °C: 53
Diesel index: 54
Cetane index: 39

Gas oil
Range, °C: 232—342
Yield, vol %: 27.1
Sulfur, wt %: 0.10
Cloud pt, °C: −11
Pour pt, °C: −12
Wax, wt %: 5.5
Aniline pt, °C: 67
Diesel index: 51
Cetane index: 49

Heavy gas oil
Range, °C: 369—509
Yield, vol %: 19.6
Sulfur, wt %: 0.22
Vis., cSt @ 37.8° C: 56.4
Pour pt, °C: 39
Wax, wt %: 26
Total nitrogen, ppm wt: 1,180
Watson K factor: 11.9
Aniline pt, °C: 86

Residue
Range, °C: 342+
Yield, vol %: 32.6
Sulfur, wt %: 0.25
Vis., cSt @ 3.78° C: 115
Pour pt, °C: 39
Wax, wt %: 22
Total nitrogen, wt %: 0.24
Carbon residue, wt %: 2.7
V/Ni, ppm wt: 1/9
Watson K factor: 11.85

Note: Numerous fields contribute to Bonny Light and Medium blends, whose qualities are also influenced by national output. Analysis is on sample taken during period of high production.

Bonny Medium, Nigeria

Bonny shore terminal and Bonny marine CALM (12 miles offshore in Atlantic)

Crude
Gravity, °API: 25.2
Sulfur, wt %: 0.23
Vis., cSt @ 37.8 °C: 12.1
Pour pt, °C: −27
Carbon residue, wt %: 1.7
V/Ni, ppm wt: <1/7
C_1—C_4 yield, wt %: 0.52

Naphtha
Range (TBP), °C: C_5—149
Yield, vol %: 6.31
Sulfur, wt %: 0.003
RON, clear: 73.5
RON + 0.44 ml TEL/l: 85.5
Paraffins, wt %: 32.8
Naphthenes, wt %: 54.7
Aromatics, wt %: 12.5

Kerosine
Range, °C.: 149—232
Yield, vol %: 12.85
Sulfur, wt %: 0.038
Aromatics, vol %: 16.5
Smoke pt, mm: 19
Freeze pt, °C.: < −70
Aniline pt, °C.: 49
Diesel index: 44
Cetane index: 32

Gas oil
Range, °C.: 232—343
Yield, vol %: 34.3
Density @ 15° C., kg/l: 0.889
Sulfur, wt %: 0.16
Vis., cSt @ 37.8 °C.: 4.7
Cloud pt, °C.: −32
Pour pt, °C.: −33
Aniline pt, °C.: 55
Diesel index: 36
Cetane index: 38

Heavy gas oil
Range, °C.: 369—509
Yield, vol %: 25.6
Density @ 15° C., kg/l: 0.9405
Sulfur, wt %: 0.31
Vis., cSt @ 37.8° C.: 162
Pour pt, °C.: 24
Total nitrogen, ppm wt: 1,790
Aniline pt, °C.: 72

Residue
Range, °C.: 342+
Yield, vol %: 45.95
Density @ 15° C., kg/l: 0.953
Sulfur, wt %: 0.37
Vis. @ 37.8 °C.: 515
Pour pt, °C.: 24
Carbon residue, wt %: 3.5
V/Ni, ppm wt: 2/15

Note: See note at end of Bonny Light assay.

Brass River, Nigeria

CALM some 12 miles off mouth of Brass

Crude
Gravity, °API @ 60° F.: 40.9
Sulfur, wt %: 0.09
Pour test, °F.: +35
Vis., SUS @ 70° F.: 38.66
Rvp, psi @ 100° F.: 6.9
Salt, lb/1,000 bbl: 3.8
V/Ni, ppm: 2.0/1.7
C_4 & lighter yield, vol %: 1.9

Gasoline
Range, °F.: 60—200
Yield, vol %: 11.2
Total sulfur, wt %: 0.001
RON, clear: 74.6
RON + 3 ml TEL/gal: 92.2
Rvp, psi: 12.4

Naphtha
Range, °F.: 200—300
Yield, vol %: 16.6
Paraffins, vol %: 44.97
Naphthenes, vol %: 43.52
Aromatics, vol %: 11.51
Total sulfur, wt %: <0.001

Naphtha
Range, °F.: 300—400
Yield, vol %: 11.5
P/N/A, vol %: 45.78/38.45/15.77
Total sulfur, wt %: 0.0087
Aniline pt, °F.: 128.0
Smoke pt, mm: 26

Kerosine
Range, °F.: 400-500
Yield, vol %: 16.9
Freezing pt, °F.: −36
P/N/A, vol %: 45.9/37.2/16.9
Total sulfur, wt %: <0.05
Aniline pt, °F.: 146.2
Smoke pt, mm: 20

Gas oil
Range, °F.: 500—650
Yield, vol %: 15.7
Gravity, °API: 33.9
Vis., SUS @ 100° F.: 41.41
Pour pt, °F.: +30
P/N/A, vol %: 47.0/32.1/20.9
Total sulfur, wt %: 0.06
Aniline pt, °F.: 167.2
Cetane index (determined): 57.4

Residue
Range, °F.: 650+
Yield, vol %: 26.5
Vis., SUS @ 210° F.: 53.55
Pour pt, °F.: +105
Total sulfur, wt %: 0.14
Rams. carbon residue, wt %: 2.31
V/Ni/Fe, ppm: 6.6/5.7/5.8

Heavy gas oil
Range (vac. flash), °F.: 625—1,100
Yield, vol %: 24.7
Aniline pt, F.: 190.1
Vis., SUS @ 130° F.: 127.55
Pour pt, °F.: +105
Sulfur, wt %: 0.33
Rams. carbon res., wt %: 0.67
V/Ni/Fe, ppm: 0.2/1.2/<0.2
Nitrogen, wt %: 0.139

Cabinda, Angola

CALM in producing area off Malongo terminal, Cabinda

Crude
Gravity, °API: 31.7
Sulfur, wt %: 0.17
Vis., SUS @ 100° F.: 93.5
Pour pt, °F.: +65
C_4 & lighter, vol %: 1.58
Rvp, psi: 3.8
V/Ni, ppm: 2.4/15.9
Salt, lb/1,000 bbl: 18
ASTM, 50% pt, °F.: >590

Light naphtha
Range (TBP), °F.: lbp—140*
Yield, vol %: 2.18
Sulfur, wt %: 0.024
RON, clear: 77.3

Light naphtha
Range, °F.: 140—170
Yield, vol %: 1.67
Sulfur, wt %: 0.018
Paraffins, vol %: 77.6
Naphthenes, vol %: 21.4
Aromatics, vol %: 1.0
RON, clear: 65.1

Heavy naphtha
Range, °F.; 170—310
Yield, vol %: 9.98
Sulfur, wt %: 0.06
P/N/A, vol %: 50.0/44.8/5.2
Aniline pt, °F.: 134.4

Kerosine
Range, °F.: 310—520
Yield, vol %: 16.27
Gravity, °API: 43.7
Sulfur, wt %: 0.08
Freezing pt, °F.: −42
Aniline pt, °F.: 148.5
Cetane index: 50.8
Smoke pt, mm: 25

Light gas oil
Range, °F.: 520—680
Yield, vol %: 15.83
Gravity, °API: 34.9
Vis., SUS @ 100° F.: 44.4
Sulfur, wt %: 0.14
Pour pt, °F.: +35
Diesel index: 61.2
Cetane index: 60.5

Heavy gas oil
Range (TBP to EFV), °F.: 680—1,000
Yield, vol %: 29.34
Gravity, °API: 25.8
Vis., SUS @ 210° F.: 55.6
Sulfur, wt %: 0.16
Total nitrogen, ppm: 1,400
Pour pt, °F.: +115
Aniline pt, °F.: 210.2
V/Ni, ppm: >0.1/0.4

Residual oil
Range, °F.: 680+
Yield, vol %: 52.87
Gravity, °API: 20.4
Vis., SUS @ 210° F.: 210
Sulfur, wt %: 0.24
Con. carbon res., wt %: 5.82
Pour pt, °F.: +95
V/Ni, ppm: 4.2/28

*Does not include C_4 and lighter

Djeno Blend, Congo (Brazzaville)

CALM located 3.8 km from Djeno tank farm

Crude
Gravity, °API: 26.87
Vis., cSt @ 10° C.: 220
Pour pt, °C.: +3
Rvp @ 37.8° C., g/sq cm: 290
Total sulfur, wt %: 0.33
Acidity, mg KOH/g: 1.10
UOP charac. factor: 12.0
V/Ni, kg/mg: <1/23
Yield C_1—C_5, vol %: 2.37

Gasoline
Range, °C.: 15—80
Yield, vol %: 2.59
RON, clear: 69.0
Sulfur, wt %: 0.0876
Aromatics, vol %: 1.3

Naphtha
Range, °C.: 80—180
Yield, vol %: 11.86
Paraffins, vol %: 52.5
Naphthenes, vol %: 39.8
Aromatics, vol %: 7.7
Sulfur, wt %: 0.16

Kerosine
Range, °C.: 180—225
Yield, vol %: 5.90
Freezing pt, °C.: −51
Smoke pt, mm: 20
Sulfur, wt %: 0.20
Aromatics, vol %: 12.5

Gas oil
Range, °C.: 225—350
Yield, vol %: 21.88
Pour pt, °C.: −10
Cloud pt, °C.: −7
Sulfur, wt %: 0.17

Heavy gas oil
Range, °C.: 400—550
Yield, vol %: 21.88
Density 15/4 °C.: 0.926
Pour pt, °C.: +39
Vis., cSt @ 50° C.: 185
V/Ni, ppm: <0.5/<1
Sulfur, wt %: 0.25
Nitrogen, pm: 944
Aniline pt, °C.: 95.7
Con. carbon residue, wt %: 0.60

Residue
Range, °C.: 350+
Yield, vol %: 57.42
Density, 15/4 °C.: 0.952
Pour pt, °C.: +30
Vis., cSt @ 50° C.: 1,850
Sulfur, wt %: 0.41

Escravos, Nigeria

CALM in offshore producing area

Crude
Gravity, °API: 36.2
Sulfur, wt %: 0.14
Vis., SUS @ 100° F.: 37.6
Pour pt, °F.: +10
C_4 & lighter, vol %: 2.24
Rvp, lb: 4.3
V/Ni, ppm: 0.3/3.8
Salt, lb/1,000 bbl: 1
Uncondensed gases, vol %: 1.95

Light naphtha
Range (TBP), °F.: Ibp—140
Yield, vol %: 2.82
Gravity, °API: 88.0
Sulfur, wt %: 0.015
RON, clear: 82.6

Light naphtha
Range (TBP), °F.: 140—170
Yield, vol %: 1.60
Gravity, °API: 74.5
Sulfur, wt %: 0.009
P/N/A, vol %: 72.0/24.6/3.4
RON, clear: 75.0

Heavy naphtha
Range (TBP), °F.: 170—310
Yield, vol %: 16.13
Gravity, °API: 55.6
Sulfur, wt %: 0.013
P/N/A, vol %: 41.6/46.5/11.9
Aniline pt, °F.: 113.9

Kerosine
Range (TBP), °F.: 310—520
Yield, vol %: 28.55
Gravity, °API: 39.5
Sulfur, wt %: 0.06
Freezing pt, °F.: −51
Aniline pt, °F.: 131.4
Cetane index: 38.5
Smoke pt (ASTM), mm: 15

Light gas oil
Range (TBP), °F.: 520—680
Yield, vol %: 19.17
Gravity, °API: 31.1
Vis., SUS @ 100° F.: 44.9
Sulfur, wt %: 0.19
Pour pt, °F.: +30
Diesel index: 49.9
Cetane index: 47.0

Heavy gas oil
Range (TBP or EFV), °F.: 680—1,000
Yield, vol %: 23.76
Gravity, °API: 22.4
Vis., SUS @ 210° F.: 56.1
Sulfur, wt %: 0.22
Nitrogen (total), ppm: 1,700
Pour pt, °F.: +120
Aniline pt, °F.: 190.0
V/Ni, ppm: >0.1/0.9

Residual oil
Range (TBP or EFV), °F.: 680+
Yield, vol %: 29.78
Gravity, °API: 19.9
Vis., SUS @ 210° F.: 93.5
Sulfur, wt %: 0.27
Con. carbon residue, wt %: 3.72
Pour pt, °F.: +115
V/Ni, ppm: 1.0/11.5

Espoir, Ivory Coast

CALM yoke with permanent floating storage in producing area

Crude
Gravity, °API: 31.4
Sp gr @ 60° F.: 0.8686
Sulfur, wt %: 0.32
Pour test, °F.: +5
Vis., SUS @ 70° F.: 69.78
Rvp @ 100° F., psi: 5.5
Salt lb/1,000 bbl: 15.0
Yield, NC_4 & lighter, vol %: 0.8
V/Ni, ppm: 1.7/5.8

Gasoline
Range, °F.: 60—200
Yield, vol %: 4.5
Total sulfur, wt %: <0.001
RON, clear (calc.): 73.6

Naphtha
Range, °F.: 200—300
Yield, vol %: 10.9
Total sulfur, wt %: 0.0049
Aniline pt, °F.: 118.5

Naphtha
Range, °F.: 300—400
Yield, vol %: 9.4
Paraffins, vol %: 43.42
Naphthenes, vol %: 48.19
Aromatics, vol %: 8.39
Total sulfur, wt %: 0.036
Aniline pt, °F.: 121.5
Smoke pt, mm: 25

Kerosine
Range, °F.: 400—500
Gravity, °API: 36.1
Vis., SUS @ 100° F.: 32.84
Freezing pt, °F.: −56
P/N/A, vol %: 26.3/50.9/22.8
Sulfur, wt %: 0.07
Aniline pt, °F.: 136.1
Smoke pt, mm: 19

Light gas oil
Range, °F.: 500—650
Yield, vol %: 17.1
Gravity, °API: 30.7
Vis., SUS @ 100° F.: 45.28
Pour pt, °F.: +10
P/N/A, vol %: 28.3/49.8/21.9
Total sulfur, wt %: 0.22
Aniline pt, °F.: 157.4

Vacuum gas oil
Range, °F.: 620—1,000
Yield, vol %: 25.7
Gravity, °API: 23.3
Aniline pt, °F.: 192.1
Vis., SUS @ 130° F.: 152.01
Pour pt, °F.: +90
Sulfur, wt %: 0.39
Rams. carbon res., wt %: 0.15
V/Ni, ppm: 0.1/0.2
Nitrogen, wt %: 0.086

Residue
Range, °F.: 650+
Yield, vol %: 42.9
Vis., SUS @ 210° F.: 125.43
Pour pt, °F.: +80
Total sulfur, wt %: 0.565
Rams. carbon res., wt %: 3.69
Nitrogen, wt %: 0.225
V/Ni, ppm: 3.8/12.6

Forcados Blend, Nigeria

CALMS some 7 miles off coast

Crude
Gravity, °API: 29.7
Sulfur, wt %: 0.29
Pour pt, °C.: −20
Kin. vis., cSt @ 10° C.: 10.6
C_4 & lighter: 0.7

Light naphtha
Range, °C.: C_5—65
Yield, wt %: 1.4
Density @ 15° C., g/cu cm: 0.650
RON + 0.4 g Pb/l: 87.5

Heavy naphtha
Range, °C.: 65—175
Yield, wt %: 12.3
Density @ 15° C., g/cu cm: 0.765
RON + 0.4 g Pb/l: 75
Aromatics, vol %: 12.0
Naphthenes, vol %: 53

Kerosine
Range, °C.: 175—225
Yield, wt %: 9.0
Density @ 15° C., g/cu cm: 0.830
Sulfur, wt %: 0.04

Gas oil
Range, °C.: 225—360
Yield, wt %: 37.8
Density @ 15° C., g/cu cm: 0.880
Sulfur, wt %: 0.18
Pour pt, °C.: −17
Cold filter pour pt, °C.: −15
Kin. vis., cSt @ 100° C.: 1.46

Heavy gas oil
Range, °C.: 360—525
Yield, wt %: 28.6
Density @ 15° C.: 0.941
Sulfur, wt %: 0.40
Kin. vis., cSt @ 100° C.: 10.6

Residue
Range, °C.: 360+
Yield, wt %: 38.8
Density @ 15° C.: 0.953
Sulfur, wt %: 0.56
Kin. vis., cSt @ 100° C.: 22.1

Gamba, Gabon

Buoy 6 km offshore from Gamba tank farm

Crude
Gravity, °API: 31.8
Vis., cSt @ 37.8° C.: 36.7
Pour pt, °C.: +23
Total sulfur, wt %: 0.11
Con. carbon, wt %: 3.10
UOP charac. factor: 12.20
Yield C_1—C_5, vol %: 1.42

Gasoline
Range, °C.: C_5—80
Yield, vol %: 1.3
Rvp, psi, g/sq cm: 800
RON, clear: 90
Sulfur, wt %: 0.0036

Heavy naphtha
Range, °C.: 80—160
Yield, vol %: 4.9
Density @ 15/4 °C.: 0.753
Paraffins, vol %: 46.9
Naphthenes, vol %: 50.6
Aromatics, vol %: 2.5
Sulfur, wt %: 0.0069

Kerosine
Range, °C.: 160—250
Yield, vol %: 11.8
Density @ 15/4 °C.: 0.808
Freezing pt, °C.: −52
Smoke pt, mm: 23
Sulfur, wt %: 0.014
Aniline pt, °C.: 64.2
Aromatics, vol %: 14.0

Gas oil
Range, °C.: 250—350
Yield, vol %: 19.3
Density @ 15/4 °C.: 0.838
Pour pt, °C.: −14
Cloud pt, °C.: −11
Vis., °Engler @ 20° C.: 1.58
Cetane index: 53
Sulfur, wt %: 0.057
Diesel index: 66
Aniline pt, °C.: 80.4

Residue
Range, °C.: +350
Yield, vol %: 62.0
Density @ 15/4 °C.: 0.900
Pour pt., °C.: +45
Vis., °Engler @ 50° C.: 18.9
Sulfur, wt %: 0.16

Kole Marine Blend, Cameroon

CALM with floating storage in offshore producing area

Crude
Gravity, °API: 34.89
Vis., cSt @ 10° C.: 11.1
Pour pt, °C.: −6
Total sulfur, wt %: 0.30
Rvp @ 37.8° C., g/sq cm: 445
Paraffins, wt %: 6.2
Con. carbon, wt %: 3.65
UOP charac. factor: 11.9
V/Ni, kg/mg: 9/27
C_1—C_5, yield, vol %: 6.12

Light gasoline
Range, °C.: 15—80
Yield, vol %: 5.71
RON, clear: 76.2

Heavy naphtha
Range, °C.: 80—180
Yield, vol %: 21.89
Density, 15/4 °C.: 0.765
Paraffins, vol %: 38.5
Naphthenes, vol %: 53.3
Aromatics, vol %: 8.2
Sulfur, wt %: 0.0080

Kerosine
Range, °C.: 180—225
Yield, vol %: 8.21
Density @ 15/4 °C.: 0.819
Freeze pt, °C.: −63
Smoke pt, mm: 20
Sulfur, wt %: 0.0467
Aromatics, vol %: 13.4

Gas oil
Range, °C.: 150—400
Yield, vol %: 43.89
Density @ 15/4 °C.: 0.839
Pour pt, °C.: −9
Vis., cSt @ 50° C.: 2.6
Cetane index: 52.0
Sulfur, wt %: 0.16

Gas oil
Range, °C.: 180—350
Yield, vol %: 30.46
Density @ 15/4 °C.: 0.838
Pour pt, °C.: −22
Sulfur, wt %: 0.15

Residue
Range, °C.: 350+
Yield, vol %: 38.91
Density @ 15/4 °C.: 0.947
V/Ni, ppm: 20/68
Pour pt, °C.: +33
Vis. @ 50° C.: 425
Ash, wt %: 0.05
Sulfur, wt %: 0.54

Lucina Marine, Gabon

CALM with floating storage in offshore producing area

Crude
Gravity, °API: 39.52
Vis., cSt @ 20° C.: 16.00
Pour pt, °C.: +15
Rvp @ 37.8° C., g/sq cm: 450
Total sulfur, wt %: 0.05
Asphaltenes, wt %: 0.06
UOP charac. factor: 12.25
V/Ni, kg/mg: 1.3/12.2

Gasoline
Range, °C.: C_5—80
Yield, vol %: 5.56
Rvp, g/sq cm: 698
RON, clear: 66.3

Heavy gasoline
Range, °C.: 80—150
Yield, vol %: 13.46
Paraffins, vol %: 54.3
Naphthenes, vol %: 37.8
Aromatics, vol %: 7.9
Sulfur, wt %: 0.005

Kerosine
Range, °C.: 150—225
Yield, vol %: 14.38
Density @ 15/4 °C.: 0.778
Freeze pt, °C.: −55
Vis., cSt @ 34.4° C.: 5.07
Smoke pt, mm: 21
Sulfur, wt %: 0.006
Aromatics, vol %: 10.6

Gas oil
Range, °C.: 150—350
Yield, vol %: 38.59
Density @ 15/4 °C.: 0.809
Pour pt, °C.: −18
Vis., °Engler @ 50° C.: 1.78
Cetane index: 60.0
Diesel index: 71.8
Sulfur, wt %; 0.010
Aniline pt, °C.: 74.2

Residue
Range, °C.: 350+
Yield, vol %: 40.23
Density @ 15/4 °C.: 0.898
Pour pt, °C.: +36
Vis., cSt @ 50° C.: 86.4
Sulfur, wt %: 0.060
Asphaltenes, wt %: 0.08
Con. carbon, wt %: 2.96
V, ppm: 3

Mandji, Gabon

Cap Lopez terminal, loading berth, Prince's Bay

Crude
Gravity, °API: 30.5
Vis., cSt @ 10° C.,: 44.0
Pour pt, °C.: +3
Rvp @ 37.8° C., g/sq cm: 270
Total sulfur, wt %: 1.10
Asphaltenes, wt %: 0.3
Con. carbon, wt %: 5.40
UOP charac. factor: 12.1
V/Ni, kg/mg: 48/50
C_1—C_5, yield, vol %: 4.46

Gasoline
Range, °C.: 15—80
Yield, vol %: 5.38
RON, clear: 74.2

Heavy naphtha
Range, °C.: 80—150
Yield, vol %: 9.63
Paraffins, vol %: 55.2
Naphthenes, vol %: 36.7
Aromatics, vol %: 8.1
Sulfur, wt %: 0.006

Kerosine
Range, °C.: 150—225
Yield, vol %: 10.37
Density @ 15/4 °C.: 0.795
Freeze pt, °C.: −53
Smoke pt, mm: 24
Sulfur, wt %: 0.101
Aromatics, vol %: 17.3
Aniline pt, °C.: 56.1

Gas oil
Range, °C.: 150—375
Yield, vol %: 36.12
Density @ 15/4 °C.: 0.839
Pour pt, °C.: −15
Vis., cSt @ 50° C.: 2.28
Cetane index: 55.1
Diesel index: 59.7
Sulfur, wt %: 0.4
Aniline pt, °C.: 69.3

Heavy gas oil
Range, °C.: 375—525
Yield, vol %: 23.10
Density @ 15/4 °C.: 0.909
Pour pt, °C.: +37
Vis., cSt @ 50° C.: 50
Nitrogen, ppm: 480
Aniline pt, °C.: 85.4
Ni, ppm: <1
Sulfur, wt %: 1.14
Con. carbon, wt %: 0.45

Residue
Range, °C.: 375+
Yield, vol %: 46.96
Density @ 15/4 °C.: 0.952
V/Ni, ppm: 93/98
Pour pt, °C.: +36
Vis., cSt @ 50° C.: 2,100
Sulfur, wt %: 1.81
Asphaltenes, wt %: 0.49
Con. carbon, wt %: 10.2

Pennington, Nigeria

CALM with export from floating storage in offshore producing area

Crude
Gravity, °API: 36.6
Sulfur, wt %: 0.07

Vis., cSt @ 104° F.: 3.06
Pour pt, °F.: 43
C_4 & lighter, vol %: 1.5
Rvp @ 100° F., psi: 5.1
Con. carbon residue, wt %: 0.7
V/Ni, ppm: 2/1

Light naphtha
Range, °F.: C_5—200
Yield, vol %: 7.4
Sulfur, wt %: 0.001
Paraffins, vol %: 70.5
Naphthenes, vol %: 25.5
Aromatics, vol %: 3.5
RON, clear: 74.9

Heavy naphtha
Range, °F.: 200—340
Yield, vol %: 14.7
Sulfur, wt %: 0.001
P/N/A, vol %: 35.0/52.5/12.0
RON, clear: 55.5
Aniline pt, °F.: 118

Kerosine
Range, °F.: 340—470
Yield, vol %: 18.0
Gravity, °API: 40.6
Sulfur, wt %: 0.02
Vis., cSt @ 104° F.: 1.45
Smoke pt, mm: 19.5
Freeze pt, °F.: –69
Aniline pt, °F.: 135
Cloud pt, °F.: <–76

Gas oil
Range, °F.: 470—650
Yield, vol %: 31.7
Gravity, °API: 33.7
Sulfur, wt %: 0.05
Vis., cSt @ 104° F.: 3.72
Pour pt, °F.: –1.0
Aniline pt, °F.: 158
Cloud pt, °F.: 6.0

Vacuum gas oil
Range, °F.: 650—1,000
Yield, vol %: 23.4
Gravity, °API: 23.5
Sulfur, wt %: 0.15
Vis., cSt @ 122° F.: 28.9
Pour pt, °F.: 102
Aniline pt, °F.: 184
Con. carbon residue, wt %: 0.12
V/Ni, ppm: 2/<1

Residue
Range, °F.: 650+
Yield, vol %: 26.7
Gravity, °API: 21.8
Sulfur, wt %: 0.17
Vis., cSt @ 122° F.: 48.5
Pour pt, °F.: 91
Aniline pt, °F.: 179
Con. carbon residue, wt %: 2.3

Qua Iboe, Nigeria

CALM in offshore producing area

Crude
Gravity, °API: 35.8
Pour pt, °F.: 45
Kin. vis., cSt @ 59° F.: 6.76
@ 104° F.: 3.39
Con. carbon residue, wt %: 0.92
Aniline pt, °C.: 62.56
Sulfur, wt %: 0.12
Rvp, psi: 6.0
Nitrogen, total, ppm: 540
V/Ni, ppm: 0.3/3.3
C_5 & lighter, yield, vol %: 5.13

Light naphtha
Range (TBP), °F.: 60—180
Yield, vol %: 5.15
Rvp, psi: 10.3
Paraffins, vol %: 67.3
Naphthenes, vol %: 31.6
Aromatics, vol %: 1.1
Sulfur, wt %: 0.0008

Heavy naphtha
Range, °F.: 180—380
Yield, vol %: 25.14
Rvp, psi: 1.0
P/N/A, vol %: 34.6/55.3/10.1
RON, clear: 56.6
RON + 3 ml TEL/gal: 76.0
Sulfur, wt %: 0.026

Kerosine
Range, °F.: 330—444
Yield, vol %: 13.64
Gravity, °API: 41.2
P/N/A, vol %: 36.4/49.3/14.3
Freezing pt, °F.: –50
Smoke pt, mm: 20
Aniline pt, °F.: 132.1
Diesel index: 54
Cetane index: 39
Sulfur, wt %: 0.05

Light gas oil
Range, °F.: 380—710
Yield, vol %: 42.63
Gravity, °API: 33.1
Pour pt, °F: 15
Aniline pt, °F.: 151.4
Sulfur, wt %: 0.11

Heavy gas oil
Range, °F.: 710—850
Yield, vol %: 12.18
Gravity, °API: 22.7
Pour pt, °F.: 95
Kin. vis., cSt @ 100° F.: 68.55
Aniline pt, °F.: 178.7
Diesel index: 41
Sulfur, wt %: 0.16
Nitrogen, total, ppm: 679
Con. carbon, wt %: 0.02

Residue
Range, °F.: 710+
Yield, vol %: 24.65
Gravity, °F.: 17.9
Pour pt, °F.: 110
Kin. vis., cSt @ 100° F.: 900.93
Sulfur, wt %: 0.23
Nitrogen, total, ppm: 1,604
Con. carbon residue, wt %: 3.36
V/Ni, ppm: 1.2/13.1

Salt Pond, Ghana

SALM with hawser-moored permanent storage in offshore producing area

Crude
Gravity, °API: 37.4
Sulfur, wt %: 0.097
C_1—C_3 yield, vol %: 0.37

Gasoline
Range, °F.: 115—180
Yield, vol %: 9.23
RON, clear: 57.0

Gasoline
Range, °F.: 180—220
Yield, vol %: 2.90
RON, clear: 51.0

Naphtha
Range, °F.: 220—250
Yield, vol %: 2.50
RON, clear: 46.5

Naphtha
Range, °F.: 250—320
Yield, vol %: 7.20

Heavy naphtha
Range, °F.: 320—360
Yield, vol %: 4.30
Aniline pt, °F.: 138

Kerosine
Range, °F.: 360—500
Yield, vol %: 16.30
Gravity, °API: 43.7
Pour pt, °F.: –36
Sulfur, wt %: 0.020
Aniline pt, °F.: 148

Gas oil
Range, °F.: 500—600
Yield, vol %: 10.90
Gravity, °API: 37.3
Pour pt, °F.: 11
Sulfur, wt %: 0.030
Aniline pt, °F.: 163

Gas oil
Range, °F.: 600—650
Yield, vol %: 5.10
Gravity, °API: 34.4
Pour pt, °F.: 38
Sulfur, wt %: 0.070
Aniline pt, °F.: 173

Heavy gas oil
Range, °F.: 650—940
Yield, vol %: 21.20
Gravity, °API: 27.9
Sulfur, wt %: 0.110
Nitrogen, %: 0.0300

Vacuum bottoms
Range, °F.: 940+
Yield, vol %: 20.00
Gravity, °API: 17.6
Sulfur, wt %: 0.250
K factor: 11.89
Vis., Sfs @ 210° F.: 263.0

Soyo Blend, Angola

Quinfequena terminal

Crude
Gravity, °API: 33.7
Sulfur, wt %: 0.23
Pour pt, °C.: +18
Vis., cSt @ 37.8° C.: 10.08
Asphaltenes, wt %: 0.72
Total acidity, mg KOH/g: 0.07
Wax content, wt % @ —30° C.: 14.7
V/Ni, ppm: 5/15
C_1—C_5 (GLC), yield, wt %: 2.33

Gasoline
Range (TBP), °C.: C_5—80
Yield, vol %: 3.86
RON + 0.4 g TEL/l: 83.7

Heavy naphtha
Range, °C.: 80—150
Yield, vol %: 9.63
Density @ 15° C.: 0.745
Naphthenes, vol %: 37.2
Aromatics, vol %: 10

Kerosine
Range, °C.: 150—230
Density @ 15° C.: 0.793
Sulfur, wt %: 0.021
Freeze pt, °C.: –53
Aromatics, vol %: 16
Smoke pt, mm: 25
Naphthenic acids, ppm: 68

Gas oil
Range, °C.: 230—340
Yield, vol %: 19.99
Density @ 15° C.: 0.838

Sulfur, wt %: 0.12
Cloud pt, °C.: −8
Cetane index: 53.0
Vis., cSt @ 50° C.: 2.73

Heavy gas oil
Range, °C.: 340—510
Yield, vol %: 26.22
Density @ 15° C.: 0.8824
Sulfur, wt %: 0.24
Aniline pt, °C.: 94.0
Basic nitrogen, ppm: 298
Total nitrogen, wt %: 0.10
Con. carbon, wt %: 0.01
V/Ni, ppm: <2/<2

Residue
Range, °C.: 340+
Yield, vol %: 52.16
Density @ 15° C.: 0.920
Sulfur, wt %: 0.21
Vis., cSt @ 50° C.: 160.8
Con. carbon, wt %: 5.5

Zaire, Zaire

CALM with moored storage in offshore producing area

Crude
Gravity, °API: 31.7
Sulfur, wt %: 0.13
Vis., SUS @ 100° F.: 98.0
Pour pt, °F.: +80
C_4 & lighter, vol %: 1.00
Rvp, lb: 2.2
V/Ni, ppm: 1.5/17.8
Salt, lb/1,000 bbl: 6
ASTM, 50% pt, °F.: >590

Light naphtha
Range (TBP), °F.: Ibp—140°
Yield, vol %: 1.84
Sulfur, wt %: 0.037
RON, clear: 79.4

Light naphtha
Range, °F.: 140—170
Yield, vol %: 1.03
Sulfur, wt %: 0.020
Paraffins, vol %: 76.5
Naphthenes, vol %: 22.2
Aromatics, vol %: 1.3
RON, clear: 65.7

Heavy naphtha
Range, °F.: 170—310
Yield, vol %: 8.84
Sulfur, wt %: 0.006
P/N/A, vol %: 53.8/41.6/4.6
Aniline pt, °F.: 133.5

Kerosine
Range, °F.: 310—520
Yield, vol %: 16.31
Sulfur, wt %: 0.074
Freezing pt, °F.: −36
Aniline pt, °F.: 147.2
Cetane index: 50.0
Smoke pt, mm: 27

Light gas oil
Range, °F.: 520—680
Yield, vol %: 15.44
Vis., SUS @ 100° F.: 45.0
Sulfur, wt %: 0.14
Pour pt, °F.: +45
Diesel index: 62.4
Cetane index: 62.0

Heavy gas oil
Range (TBP to EFV), °F.: 680—1,000
Yield, vol %: 31.39
Gravity, °API: 26.7
Vis., SUS @ 210° F.: 54.0
Sulfur, wt %: 0.12
Total nitrogen, ppm: 1,010
Pour pt, °F.: +115
Aniline pt, °F.: 214.3
V/Ni, ppm: 0.1/0.3

Residual oil
Range, °F.: 680+
Yield, vol %: 55.65
Gravity, °API: 21.4
Vis., SUS @ 210° F.: 181.9
Sulfur, wt %: 0.17
Con. carbon res., wt %: 6.03
Pour pt, °F.: +100
V/Ni, ppm: 2.5/30
*Does not include C_4 and lighter

North Africa

Amna (high pour), Libya

Ras Lanuf/CBMs & SPM

Crude
Gravity, °API: 36.1
Sulfur, wt %: 0.15
Pour pt, °F.: 75
Kin. vis., cSt @ 37.8° C.: 13.70
Car. residue (CCR), wt %: 3.7
Rvp, psi: 3.9
Salt, lb/1,000 bbl: 8.2
V/Ni, ppm: 0.6/5.0
Ibp-60° F., yield, vol %: 2.11

Light naphtha
Range, °F.: 60-120
Yield, vol %: 2.4
Gravity, °API: 93.6
Sulfur, wt %: 0.01
Paraffins, vol %: 99.0
Naphthenes, vol %: 1.0
RON, clear: 78.0
RON + 3 ml TEL: 94.0

Light naphtha
Range, °F.: 120-250
Yield, vol %: 7.7
Gravity, °API: 69.5
Sulfur, wt %: 0.01
Paraffins, vol %: 69.9
Naphthenes, vol %: 26.5
Aromatics, vol %: 3.7

Heavy naphtha
Range, °F.: 250-330
Yield, vol %: 6.9
Gravity, °API: 57.4
Sulfur, wt %: 0.02
P/N/A, vol %: 60.5/33.6/5.9

Kerosine
Range, °F.: 330-443
Yield, vol %: 9.4
Gravity, °API: 49.9
Sulfur, wt %: 0.05
P/N/A, vol %: 60.9/29.9/9.2
Pour pt, °F.: −75
Freezing pt, °F.: −58
Aniline pt, °F.: 150.6
Diesel index: 75
Smoke pt, mm: 31

Gas oil
Range, °F.: 443-600
Yield, vol %: 15.0
Gravity, °API: 42.3
Sulfur, wt %: 0.07
Pour pt, °F.: 0
Aniline pt, °F.: 169.1
Diesel index: 71

Gas oil
Range, °F.: 600-850
Yield, vol %: 23.3
Sulfur, wt %: 0.13
Pour pt, °F.: 80
Aniline pt, °F.: 202.0
Diesel index: 69

Residual oil
Range, °F.: 655+
Yield, vol %: 55.4
Gravity, °API: 25.4
Sulfur, wt %: 0.22
Pour pt, °F.: 100
Car. residue CCR, wt %: 6.22
V/Ni, ppm: 1.1/8.5

Residual oil
Range, °F.: 1,000+
Yield, vol %: 21.8
Gravity, °API: 16.7
Sulfur, wt %: 0.31
Pour pt, °F.: 130
Car. residue CCR, wt %: 14.50
V/Ni, ppm: 2.5/20.0

Ashtart, Tunisia

Floating storage barge in Gulf of Gabes producing area

Crude
Gravity, °API: 29.03
Vis. @ 20° C., cSt: 24.0
Pour pt, °C.: +9
Rvp @ 38.7° C., g/sq cm: 130
Total sulfur, wt %: 1.0
Paraffins/Asphaltenes, wt %: 11.0/1.8
Con. carbon, wt %: 5.4
$>C_1$-C_5, vol %: 1.26
V/Ni, mg/kg: 20/9

Light naphtha
Range (TBP), °C.: 15-100
Yield, vol %: 5.65
Density, 15/4 °C.: 0.702
Rvp, g/sq cm: 500
RON, clear: 63.6
Aromatics, vol %: 10.0

Heavy naphtha
Range (TBP), °C.: 100-145
Yield, vol %: 6.42
Density, 15/4 °C.: 0.759
Paraffins, vol %: 47.2
Naphthenes, vol %: 37.8
Aromatics, vol %: 15.0
Sulfur, wt %: 0.0055

Heavy naphtha
Range (TBP), °C.: 145-180
Yield, vol %: 5.91
Density, 15/4 °C.: 0.785
P/N/A, vol %: 46.5/33.8/19.7
Sulfur, wt %: 0.0120

Kerosine
Range (TBP), °C.: 180-225
Yield, vol %: 6.65
Density, 15/4 °C.: 0.812
Freeze pt, °C.: −54
Vis., cSt @ 50° C.: 1.10
Smoke pt, mm: 21
Sulfur, wt %: 0.04
Aniline pt, °C.: 54.0
Aromatics, vol %: 18.9

Gas oil
Range (TBP), °C.: 145-350
Yield, vol %: 36.04
Density, 15/4 °C.: 0.834
Pour pt, °C.: −21
Cloud pt, °C.: −16
Filterability, °C.: −19
Vis, cSt @ 50° C.: 1.9
Cetane index: 48.8
Sulfur, wt %: 0.44
Diesel index: 54.7
Aniline pt, °C.: 62.0
Con. carbon @ 10%, wt %: <0.05

Residue
Range (TBP), °C.: 350+
Yield, vol %: 51.90
Density, 15/4 °C.: 0.943
Pour pt, °C.: +18
Vis. cSt, @ 50° C.: 225
Sulfur, wt %: 1.42
Con. carbon, wt %: 9.4
V/Ni, ppm: 34/17
N, wt %: 0.40

Brega, Libya

Marsa el Brega/ CBM, SPM, SBM

Crude
Gravity, °API: 40.4
Sulfur, wt %: 0.21
Pour pt, °F.: +30
Rvp, psi: 6.4
Kin., cSt @ 70° F.: 5.58
@ 100° F.: 3.56

Light naphtha
Range, °F.: 68-212
Yield, vol %: 12.4
Gravity, °API: 73.8
Sulfur, wt %: 0.014
Rvp, psi: 7.4
Paraffins, vol %: 72.5
Naphthenes, vol %: 25.3
Aromatics, vol %: 2.2
RON, clear: 65.1

Heavy naphtha
Range, °F.: 212-302
Yield, vol %: 10.7
Gravity, °API: 56.8
Sulfur, wt %: 0.020
P/N/A, vol %: 53.1/39.4/7.5

Kerosine
Range, °F.: 302-455
Yield, vol %: 17.4
Gravity, °API: 46.7
Sulfur, wt %: 0.035
P/N/A, vol %: 51.2/34.7/14.1
Freeze pt, °F.: −70
Smoke pt, mm: 27
Luminometer no.: 61
Aniline pt, °F.: 144
Kin. vis., cSt @ 30° F.: 5.50
@ 100° F.: 1.17

Light gas oil
Range, °F.: 455-650
Yield, vol %: 20.3
Gravity, °API: 38.1
Sulfur, wt %: 0.10
Pour pt, °F.: +15
Aniline pt, °F.: 172
Kin. vis., cSt @ 100° F.: 3.61

Heavy gas oil
Range, °F.: 650-1,049
Yield, vol %: 27.8
Gravity, °API: 27.7
Sulfur, wt %: 0.30
Pour pt, °F.: 105
Aniline pt, °F.: 206
Kin. vis., cSt @ 150° F.: 14.9

Residual oil
Range, °F.: 650+
Yield, vol %: 36.8
Gravity, °API: 23.6
Sulfur, wt %: 0.41
Pour pt, °F.: 95
Con. carbon wt %: 4.1
Kin. vis., cSt @ 100° F.: 184
@ 122° F.: 92.0

Residual oil
Range, °F.: 1,049+
Yield, vol %: 9.0
Gravity, °API: 12.3
Sulfur, wt %: 0.69
Pour pt, °F.: >120
Con. carbon, wt %: 14.6
Kin. vis., cSt @ 210° F.: 620
V/Ni/Fe, ppm: 24/32/124

Bu Attifel, Libya

Zueitina/CBM & SBM

Crude
Gravity, °API: 43.6
Rvp, psi: 0
Sulfur, wt %: 0.034
Pour pt, °F.: +90

Light ends
Range vapor temp., °F.: Ibp-160
Yield, vol %: 2.5

Light naphtha
Range, vapor temp., °F.: 160-290
Yield, vol %: 9.0
Gravity, °API: 62.5
Paraffins, vol %: 75.4
Olefins, vol %: 0.4
Naphthenes, vol %: 18.3
Aromatics, vol %: 5.9

Heavy naphtha
Range, VT, °F.: 290-390
Yield, vol %: 9.0
Gravity, °API: 56.8
Sulfur, wt %: 0.0015
P/O/N/A, vol %: 75.7/0.4/17.8/6.1

Kerosine
Range, VT, °F.: 390-500
Yield, vol %: 11.7
Gravity, °API: 50.3
Sulfur, wt %: 0.005
Aromatics, vol %: 5.6
Smoke pt, mm: 22
Freeze pt, °F.: 9.4
Pour pt, °F.: −10

Diesel
Range, VT, °F.: 500-635
Yield, vol %: 11.3
Gravity, °API: 44.0
Sulfur, wt %: 0.0140
Vis., SSU @ 100° F.: 38.4
Aniline pt, °F.: 192.5
Diesel index: 84.7
Pour pt, °F.: 45

Lt. gas oil
Range, VT, °F.: 635-775
Yield, vol %: 20.7
Gravity, °API: 41.6
Sulfur, wt %: 0.03
Vis., SSU @ 100° F.: 49.5
Pour pt, °F.: +85
UOP "K" factor: 12.6

Heavy gas oil
Range, VT, °F.: 775-932
Yield, vol %: 20.6
Gravity, °API: 37.4
Sulfur, wt %: 0.04
Vis., SSF @ 210° F.: 41.6
Pour pt, °F.: +125
UOP "K" factor: 12.8

Residue
Range, °F.: 932+
Yield, vol %: 15.2
Gravity, °API: 29.2
Sulfur, wt %: 0.10
Carbon residue, wt %: 1.5

El Borma, Tunisia

La Skhirra, Tunisia

Crude
See Algerian Zarzaitine assay. One blend has two names.

Es Sider, Libya

Es Sider/3 CBMs, 1 SBM

Crude
Gravity, °API: 36.7
Kin. vis., cSt @ 100° F.: 5.26
Con. carbon residue, wt %: 1.8
Sulfur, wt %: 0.37
V/Ni, ppm: 1.5/5.6
Pour pt, °C.: +7.2
Rvp, psi: 6.3
C_4 & lighter, vol %: 2.3

Naphtha
Range (TBP), °F.: 82-342
Yield, vol %: 22.2
Gravity, °API: 64.8
Paraffins, vol %: 57.8
Naphthenes, vol %: 36.5
Sulfur, wt %: 0.03

Kerosine
Range (TBP), °F.: 342-472
Yield, vol %: 11.3
Gravity, °API: 46.3
Sulfur, wt %: 0.13
Aromatics, vol %: 13

Heavy distillate
Range (TBP), °F.: 472-705
Yield, vol %: 28.0
Gravity, °API: 35.7
Sulfur, wt %: 0.31

Gas oil
Range (TBP), °F.: 705-980
Yield, vol %: 20.3
Gravity, °API: 25.5
Sulfur, wt %: 0.48

Residue
Range (TBP), °F.: 980+
Yield, vol %: 15.9
Gravity, °API: 12.3
Sulfur, wt %: 1.16
Kin. vis., cSt @ 210° F.: 500
Con. carbon residue, wt %: 14.7
V/Ni, ppm: 8/30

Saharan Blend,* Algeria

Arzew (3 CBMs)
Bejaia (4 jetties)
Skikda

Crude
Gravity, °API: 45.5 (43.7)
Rvp, psi: 8.7 (8.1)
Sulfur, wt %: 0.053 (0.090)
Pour pt, °F.: < −20 (< −20)
Vis. SSU @ 70° F.: 37.3 (40.1)

Light ends
Range, vapor temp., °F.: Ibp-160
Yield, vol %: 10.4 (9.9)

Light naphtha
Range, vapor temp., °F.: 160-290
Yield, vol %: 18.3 (14.9)
Gravity, °API: 64.0 (63.7)
Paraffins, vol %: 70.8 (70.2)
Olefins, vol %: 0.3 (0.4)
Naphthenes, vol %: 21.8 (23.4)
Aromatics, vol %: 7.1 (6.0)

Heavy naphtha
Range, VT, °F.: 290-390
Yield, vol %: 13.7 (14.5)
Gravity, °API: 53.3 (52.1)
P/O/N/A, vol %: 47.4/0.3/36.4/15.9 (55.0/0.3/29.6/15.1)

Kerosine
Range, VT, °F.: 390-500
Yield, vol %: 14.1 (13.4)
Gravity, °API: 44.6 (44.0)
Sulfur, wt %: 0.0056 (0.0030)
Aromatics, vol %: 15.8 (16.4)
Smoke pt, mm: 17 (21)
Freeze pt, °F.: −38.2 (−42.7)

Diesel
Range, VT, °F.: 500-635
Yield, vol %: 12.7 (12.8)
Gravity, °API: 36.6 (35.1)
Sulfur, wt %: 0.0571 (0.0736)
Vis. SSU @ 100° F.: 41.6 (40.3)
Pour pt, °F.: +15 (+5)
Aniline pt, °F.: 170 (165.5)
Diesel index: 62.2 (58.1)

Light gas oil
Range, VT, °F.: 635-775
Yield, vol %: 9.3 (14.3)
Gravity, °API: 31.1 (31.7)
Sulfur, wt %: 0.07 (0.13)
Vis. SSU @ 100° F.: 57.5 (63.0)
Pour pt, °F.: +50 (+40)

Heavy gas oil
Range, VT, °F.: 775-932
Yield, vol %: 12.0 (10.0)
Gravity, °API: 28.6 (26.5)
Sulfur, wt %: 0.10 (0.18)
Vis., SSU @ 210° F.: 49.6 (54.5)
Pour pt, °F.: +90 (+90)
Carbon residue, wt %: 0.05 (0.06)

Residue
Range, VT, °F.: 932+
Yield, vol %: 9.5 (10.2)
Gravity, °API: 21.2 (19.9)
Sulfur, wt %: 0.22 (0.28)
Vis., SSF @ 210° F.: 38.0 (45.1)
Carbon residue, wt %: 6.8 (7.4)

*Gravity of Saharan Blend has not been consistent. Values in parenthesis are those for 43.7 °API blend

Sarir, Libya

Marsa al Hariga (Tobruk)/CBM

Crude
Gravity, °API: 38.3
Sulfur, wt %: 0.18
Pour pt, °F.: 25
Kin. vis. cSt @ 50° C.: 4.73
Yield, C_2-C_4, vol %: 3.82
V/Ni, ppm: 6/14

Naphtha
Range, °C.: Ibp-180
Yield, vol %: 22.89
Total sulfur, ppm: 14
Paraffins, vol %: 60.8
Naphthenes, vol %: 35.8
Aromatics, vol %: 3.4

Kerosine
Range, °C.: 180-250
Yield, vol %: 11.27
Total sulfur, ppm: 83
Smoke pt, mm: 30

Gas oil
Range, °C.: 250-320
Yield, vol %: 10.99
Total sulfur, wt %: 0.063
Pour pt, °C.: −6
Aniline pt, °C.: 80

Resid
Range, °C.: 320+
Yield, vol %: 51.41
Total sulfur, wt %: 0.24
Vis. cSt @ 60° C.: 49
Con. carbon, wt %: 6.8

Resid
Range, °C.: 550+
Yield, vol %: 17.25
Total sulfur, wt %: 0.35
Con. carbon, wt %: 20
Asphaltenes, wt %: 4.7

Sirtica, Libya

Ras Lanuf/CBMs & SBM

Crude
Gravity, °API: 43.3
Total sulfur, wt %: 0.43
Pour pt, °C.: −3
Yield C_2-C_4, wt %: 3.24
Rvp, psi: 10.1

Condensate
Yield, vol %: 42

Naphtha
Range, °C.: Ibp-180
Yield, vol %: 39.7
Gravity, °API: 62.8
Total sulfur, wt %: 0.015
P/N/A, vol %: 69.7/22.8/7.5

Gas oil
Range, °C.: 180-350
Yield, vol %: 29.8
Gravity, °API: 38.7
Total sulfur, wt %: .21
Pour pt, °C.: −15

Resid
Range, °C.: 350+
Yield, vol %: 25.5
Gravity, °API: 19.1
Total sulfur, wt %: 1.16
Vis. cSt @ 180° F.: 39.0
Pour pt, °C.: 39
Con. carbon, wt %: 5.7

Zarzaitine, Algeria

La Skhirra, Tunisia

Crude
Gravity, °API: 43.0
Vis. cSt @ 10° C.: 6.90
Pour pt, °C.: −12
Rvp @ 37.8° C., g/sq cm: 603
Total sulfur, wt %: 0.07
Paraffins, wt %: 4.89
Con. carbon, wt %: 0.90
V/Ni, mg/kg: 1/3
Yield C_1-C_5, vol %: 7.31

Light naphtha
Range, °C.: C_5-80
Yield, vol %: 8.94
Density, 15/4 °C.: 0.662
RON, clear: 68.8
MON, clear: 64.6
Aromatics, vol %: 0.9

Heavy naphtha
Range, °C.: 80-145
Yield, vol %: 15.13
Density, 15/4 °C.: 0.738
Paraffins, vol %: 59.4
Naphthenes, vol %: 33.9
Aromatics, vol %: 6.7
Sulfur, wt %: 0.0138

Kerosine
Range, °C.: 145-225
Yield, vol %: 16.58
Density, 15/4 °C.: 0.784
Freeze pt, °C.: −65
Vis. cSt @ 34.4° C.: 4.50
Smoke pt, mm: 25
Sulfur, wt %: 0.0162
Aromatics, vol %: 14.2

Gas oil
Range, °C.: 225-290
Yield, vol %: 12.55
Density, 15/4 °C.: 0.822
Pour pt, °C.: −36
Cloud pt, °C.: −27
Filterability, °C.: −34
Vis. cSt @ 50° C.: 1.95
Sulfur, wt %: 0.025

Gas oil
Range, °C.: 290-350
Yield, vol %: 10.89
Density, 15/4 °C.: 0.843
Pour pt, °C.: −3
Vis. cSt @ 50° C.: 4.18
Sulfur, wt%: 0.045

Residue
Range, °C.: 350+
Yield, vol %: 32.47
Pour pt, °C.: +21
Density, 15/4 °C.: 0.899
Vis., cSt @ 50° C.: 80
Sulfur, wt %: 0.155
Asphaltenes, wt %: 0.21
Con. carbon, wt %: 2.48
V, ppm: 2.5

Zueitina, Libya

Zueitina/CBMs & SBM

Crude
Gravity, °API: 41.3
Rvp, psi: 4.6
Sulfur, wt %: 0.28
Pour pt, °F.: 45
Vis. SSU @ 60° F.: 199.1

Light ends
Range, °F.: Ibp–113
Yield, vol %: 6.44

Light naphtha
Range, °F.: 113-220
Yield, vol %: 9.32
Gravity, °API: 66.9
Paraffins, vol %: 65.5
Naphthenes, vol %: 30.9
Aromatics, vol %: 3.6

Naphtha
Range, °F.: 220-390
Yield, vol %: 21.42
Gravity, °API: 53.9
Sulfur, wt %: 0.04
P/N/A, vol %: 59.2/27.0/10.2

Kerosine
Range, °F.: 315-500
Yield, vol %: 21.65

Gravity, °API: 45.6
Total sulfur, wt %: 0.11
Aromatics, vol %: 14.0
Smoke pt, mm: 27
Freeze pt, °F.: −36
Pour pt, °F.: −45

Light distillate
Range, °F.: 390-550
Yield, vol %: 18.16
Gravity, °API: 41.7
Cetane index: 53.0
Total sulfur, wt %: 0.17
Aniline pt, °F.: 159.0
Pour pt, °F.: −10

Light gas oil
Range, °F.: 450-650
Yield, vol %: 21.17
Gravity, °API: 38.4
Cetane index: 57.8
Total sulfur, wt %: 0.24
Total nitrogen, ppm: 78
Aniline pt, °F.: 173.0
Pour pt, °F.: 25

Heavy gas oil
Range, °F.: 650-1,000
Yield, vol %: 24.09
Gravity, °API: 29.1
Sulfur, wt %: 0.36
Total nitrogen, ppm: 922
Pour pt, °F.: 100
Carbon residue, wt %: 0.18

Vacuum flashed resid
Range, °F.: 1,000+
Yield, vol %: 10.11
Gravity, °API: 13.5
Total sulfur, wt %: 0.90

Asia

Ardjuna, Indonesia

SBM 18.5 miles off north coast of Java in producing area

Crude
Gravity, °API: 35.2
Sulfur, wt %: 0.105
Pour pt, °F.: 75
Rvp, lb: 5.3
Kin. vis. @ 100° F.: 3.738
Carbon residue, wt %: 1.38
V/Ni, ppm: <1/3
Nitrogen, ppm: 280
Yield, C_4 & lighter, vol %: 2.6

Naphtha
Range (TBP), °F.: C_5—150
Yield, vol %: 5.0
Sulfur, wt %: 0.005
RON, clear: 76.6
RON + 0.5 g TEL/gal: 82.7
MON, clear: 74.8

Heavy naphtha
Range, °F.: 150-380
Yield, vol %: 27.2
Gravity, °API: 50.8
Sulfur, wt %: 0.012
Paraffins, vol %: 34.3
Naphthenes, vol %: 46.0
Aromatics, vol %: 19.7
RON, clear: 64.6
MON, clear: 63.0

Distillate
Range, °F.: 380-520
Yield, vol %: 16.4
Gravity, °API: 33.0
Sulfur, wt %: 0.059
Pour pt, °F.: −65
Cetane no.: 36.3
Smoke pt, °F.: 12.5
Freezing pt, °F.: −39.5
Aromatics, vol %: 34.6
Total N, ppm: 4.0
Cloud pt, °F.: −46
Vis., cSt @ 100° F.: 1.967

Distillate
Range, °F.: 520-650
Yield, vol %: 14.0
Gravity, °API: 30.7
Sulfur, wt %: 0.099
Pour pt, °F.: −65
Cetane no.: 47.0
Total N, ppm: 33.0
Cloud pt, °F.: −26
Vis., cSt @ 100° F.: 4.689

Blended gas oil
Range, °F.: 650-840
Yield, vol %: 16.9
Gravity, °API: 25.1
Sulfur, wt %: 0.156
Aniline pt, °C.: 86.7
Pour pt, °F.: 90
Kin. vis. @ 210° F.: 3.983
Carbon residue, wt %: 0.02
Total nitrogen, ppm: 200

Residue
Range, °F.: 650+
Yield, vol %: 34.8
Gravity, °API: 21.1
Sulfur, wt %: 0.199
Carbon residue, %: 2.94
Total nitrogen, ppm: 670
Pour pt, °F.: 100
Kin. vis. @ 210° F.: 5.414

Vacuum residue
Range: Bottoms from vacuum flashed 650+ °F. resid @ 725° F.
Yield, vol %: 5.9
Gravity, °API: 5.1
Sulfur, wt %: 0.292
Carbon residue, wt %: 17.86
V/Ni, ppm: 7/30

Arimbi, Indonesia

Balongan sea terminal/SBM about 6.5 nautical miles off north coast of Java

Crude
Gravity, °API: 31.8
Sulfur, wt %: 0.204
Pour pt, °F.: 100
Vis., cSt @ 100° F.: 12.54
Carbon residue, wt %: 2.41
V/Ni, ppm: 0.9/2.6
Nitrogen, ppm: 531

Naphtha
Range (TBP), °F.: C_5—230
Yield, vol %: 10.6
Sulfur, wt %: <0.001
RON, clear: 64.6
RON + 0.5 g TEL/gal: 71.7

Naphtha
Range, °F.: 230-335
Yield, vol %: 11.2
Sulfur, wt %: 0.030
Total nitrogen, ppm: 1
Paraffins, vol %: 42.3
Naphthenes, vol %: 47.0
Aromatics, vol %: 10.7

Distillate
Range, °F.: 335-520
Yield, vol %: 17.3
Gravity, °API: 34.6
Sulfur, wt %: 0.107
Cetane no.: 37.3
Smoke pt, °F.: 14
Freezing pt, °F.: −32
Aromatics, vol %: 35.3

Distillate
Range, °F.: 520-650
Yield, vol %: 14.7
Gravity, °API: 31.6
Sulfur, wt %: 0.213
Pour pt, °F.: 45
Cetane no.: 50.2
Cloud pt, °F.: 50
Vis., cSt @ 100° F.: 5.450

Blended gas oil
Range, °F.: 650-840
Yield, vol %: 15.9
Gravity, °API: 29.0
Sulfur, wt %: 0.168
Aniline pt, °C.: 93.4
Pour pt, °F.: 110
Vis., cSt @ 210° F.: 4.385
Carbon residue, %: 0.008
Nitrogen, ppm: 266

Residue
Range, °F.: 650+
Yield, vol %: 45.9
Gravity, °API: 20.5
Sulfur, wt %: 0.240
Carbon residue, %: 5.27
Total nitrogen, ppm: 1,010
Pour pt, °F.: 120+
Vis. @ 210° F. (D2170): 22.29
V/Ni, ppm: 2.7/9.8

Attaka, Indonesia

Santan marine terminal about 80 miles north of Balikpapan, Kalimantan/SBM about 4 miles offshore

Crude
Gravity, °API: 42.3
Vis., cSt @ 70° F.: 1.7
Pour pt, °F.: −10
Rvp @ 100° F., psi: 6.8
Total acid no., Mg KOH/g: 0.20
Sulfur, wt %: 0.09
Wax, wt %: 4.22
Con. carbon residue, wt %: 0.34
Charac. factor, K UOP: 11.5

Naphtha
Range, °C.: C_5—100
Yield, vol %: 15.3
RON, clear: 74.9

Naphtha
Range, °C.: 100-150
Yield, vol %: 17.6
Paraffins, vol %: 41
Naphthenes, vol %: 35
Aromatics, vol %: 24.7

Kerosine
Range, °C.: 150-250
Yield, vol %: 29.6
Smoke pt, mm: 16
Freezing pt, °C.: −54

Gas oil
Range, °C.: 250-350
Yield, vol %: 25
Diesel index: 51
Cetane no.: 52.6

Fuel oil
Range, °C.: 350+
Yield, vol %: 12.5
Sulfur, wt %: 0.11
Pour pt, °F.: 100

Note: Attaka is mixed wtih Badak crude and other streams and shipped with Attaka specifications.

Badak, Indonesia

Santan terminal about 80 miles north of Balikpapan, Kalimantan/SBM some 4 miles offshore

Crude
Gravity, °API: 41.3
Vis., cSt @ 100° F.: 5.72
Pour pt, °F.: −15
Rvp @ 100° F., psi: 5.6
Total acid number, mg KOH/g: 0.11
Sulfur, wt %: 0.08
Wax, wt %: 7.35
Con. carbon, wt %: 0.313
Charac. factor, K UOP: 12.5
Note: Badak is mixed with Attaka crude and shipped with Attaka specifications.

Bekapai, Indonesia

Senipah marine terminal about 27 miles northeast of Balikpapan, Kalimantan/SBM about 6 miles offshore

Crude
Gravity, °API: 40
Sulfur, wt %: 0.08
Pour pt, °C.: −21
Rvp, psi: 1.9
Vis.,cSt @ 37.8° C.: 2.02
Con. carbon, wt %: 0.25
Asphaltenes, wt %: <0.05
V/Ni, ppm: <0.5/<0.5
Yield C_4 & lighter, wt %: 0.51

Gasoline
Range, °C.: C_5—100
Yield, wt %: 8.17
Gravity, °API: 63.6
Sulfur, ppm: <1
Paraffins, vol %: 45.8
Naphthenes, vol %: 47.6
Aromatics, vol %: 6.6
RON, clear: 73.8
RON + 0.6 g TEL/l: 88.5

Naphtha
Range, °C.: 100-185
Yield, wt %: 25.12
Gravity, °API: 49.1
Sulfur, ppm: 68
P/N/A, vol %: 33.2/48.9/17.9

Kerosine
Range, °C.: 185-230
Yield, wt %: 15.98
Gravity, °API: 42.5
Sulfur, wt %: 0.038
Aromatics, vol %: 18
Smoke pt, mm: 22
Freezing pt., °C.: −50.5

Gas oil
Range, °C.: 185-375
Yield, wt %: 52.06
Gravity, °API: 37.5
Sulfur, wt %: 0.083
Vis., cSt @ 37.8° C.: 2.62
Aniline pt, °C.: 67.6
Pour pt, °C.: −21

Residue
Range, °C.: 375+
Yield, wt %: 14.14
Gravity, °API: 18.9
Sulfur, wt %: 0.22
Vis., cSt @ 50° C.: 835
Pour pt, °C.: >+45
Con. carbon, wt %: 1.7
V/Ni, ppm: <2/2

Bekok, Malaysia

Piped ashore to terminal north of Chukai, Kuala Trengganu area, peninsular Malaysia as part of Tapis Blend

Crude
Gravity, °API: 49.07
Vis., cSt @ 100° F.: 1.74
Pour pt, °F.: 26
Sulfur, ppm: 210
Total nitrogen, wt %: 0.0136
Neutralization no., mg KOH/g: 0.035
Rvp, psi: 7.6
Con. carbon residue, wt %: 0.22
V/Ni, ppm: <l/<l
Wax, wt %: 6.05
Yield, C_4 & lighter: 2.7

Light naphtha
Range, °F.: C_5-145
Yield (VT), vol %: 7.05
RON, clear: 72

Heavy naphtha
Range, °F.: 145-330
Yield, vol %: 26.76
Sulfur, ppm: 5
Total nitrogen, ppm: 0.7
RON, clear: 45
Paraffins, wt %: 57.40
Naphthenes, wt %: 29.27
Aromatics, wt %: 13.33

Kerosine
Range, °F.: 330-450
Yield, vol %: 15.74
Sulfur, ppm: 20
Freezing pt, °F.: −45
Cloud pt, °F.: −47
Smoke pt, mm: 20
Cetane index: 57.33
Diesel index: 76.48
Vis., cSt @ 70° F.: 1.64

Distillate
Range, °F.: 450—650
Yield, vol %: 26.13
Gravity, °API: 41.65
Sulfur, ppm: 220
Cetane index: 64.34
Diesel index: 74.34
Aniline pt, °C.: 81.5
Vis., cSt @ 70° F.: 5.15

Heavy gas oil
Range, °F.: 680-975
Yield, vol %: 15.85
Gravity, °API: 32.84
Sulfur, ppm: 600
Total nitrogen, ppm: 533
Pour pt, °F.: 113
Con. carbon residue, wt %: 0.059
Sodium, ppm: 13.84
V/Ni, ppm: 0.008/<0.01
Vis., cSt @ 130° F.: 11.32

Atmospheric residue
Range, °F.: 650+
Yield, vol %: 21.62
Gravity, °API: 31.54
Sulfur, ppm: 700
Pour pt, °F.: 113
Con. carbon residue, wt %: 1.986
Sodium, ppm: 0.125
V/Ni, ppm: <0.002/<0.01
Vis., cSt @ 130° F.: 27.37

Note: Bekok is contributor to Tapis blend

Bintulu, Malaysia

Bintulu SBM terminal off Sarawak

Crude
Gravity, °API: 26.5
Vapor pressure, Kg/sq cm: 0.21
Pour pt, °C.: −5.0
Vis., cSt @ 56° C.: 4.54
Carbon residue, wt %: 1.69
Sulfur, wt %: 0.13
Acid no. KOH mg/g: 0.43
Nitrogen, ppm: 450
Distillation, °C.:
Ibp—28
5%—104
10%—135
15%—169
20%—199
25%—227
30%—245
35%—259
40%—273
45%—285
47%—290

Note: Bintulu comes solely from Temana field offshore Sarawak

Bunyu, Indonesia

Bunyu Island terminal off east coast of Kalimantan/Four point CBM

Crude
Gravity, °API: 31.7
Vis., cSt @ 100° F.: 2.67
Pour pt, °F.: 60
Rvp @ 100° F., psi: 1.0
Sulfur, wt %: 0.09
Wax, wt %: 8.3
Con. carbon residue, wt %: 0.39
Charac. factor, K UOP: 11.4

Gasoline
Range, °C.: C_5—175
Yield, vol %: 18.5
RON, clear: 74.9

Kerosine
Range, °C.: 175-300
Yield, vol %: 49.0
Smoke pt, mm: 10

Gas oil
Range, °C.: 300-350
Yield, vol %: 13.0
Diesel index: 41

Residue
Range, °C.: 350+
Yield, vol %: 19.5
Sulfur, wt %: 0.20
Pour pt, °F.: 115

Note: In late 1982 there were plans to mix Bunyu with Sembakung crude (37 °API). This assay of sample that did not contain Sembakung.

Champion Export, Brunei

Seria SBM

Crude
Gravity, °API: 23.9
Vis. @ 10° C., sq mm/sec: 21.1
Sulfur, wt %: 0.12
Wax, wt %: 0.4
Pour pt, °C.: < -36
Total acid no., mg KOH/g: 0.50
UOP K factor: 11.2
Yield light hydrocarbons, wt %: 0.70

Gasoline
Range, °C.: C_5—65
Yield, vol %: 0.4
Rvp, kPa: 70

Naphtha
Range, °C.: 65—100
Yield, vol %: 2.0
Sulfur, mg/kg: 24
RON, clear: 77
RON + 0.5 g Pb/l (TEL): 88

Naphtha
Range, °C.: 100-150
Yield, vol %: 4.5
SUlfur, mg/kg: 74
RON, clear: 71
Paraffins, wt %: 20
Naphthenes, wt %: 69
Aromatics, wt %: 11

Naphtha
Range, °C.: 150-200
Yield, vol %: 8.1
Density @ 15° C., kg/l: 0.827
Sulfur, mg/kg: 251
P/N/A, wt %: 15/69/16
Smoke pt, mm: 22

Kerosine
Range, °C.: 200-250
Yield, vol %: 16.2
Density @ 15° C.: 0.870
Sulfur, wt %, 0.06
Cloud pt, °C.: < -60
Smoke pt, mm: 18
Aniline pt, °C.: 46.9
Cetane no.: 31

Gas oil
Range, °C.: 250-300
Yield, vol %: 22.6
Density @ 15° C., kg/l: 0.899
Vis. @ 40° C., sq mm/sec: 3.84
Pour pt, °C.: -57
Aromatics, wt %: 36
Smoke pt, mm: 15
Cetane no.: 29

Gas oil
Range, °C.: 300-350
Yield, vol %: 15.2
Density @ 15° C., kg/l: 0.930
Vis. @ 40° C., sq mm/sec: 10.2
Sulfur, wt %: 0.17

Heavy gas oil
Range, °C.: 350-370
Yield, vol %: 4.3
Density @ 15° C., kg/l: 0.951
Pour pt, °C.: -6
Total nitrogen, mg/kg: 194

Residue
Range, °C.: 370+
Yield, vol %: 26.4
Density @ 15° C.; kg/l: 0.991
Vis. @ 60° C., sq mm/sec: 912
Sulfur, wt %: 0.25
Pour pt, °C.: 21
V/Ni, mg/kg: <1/3

Note: Assay sample contained 67 vol % Champion crude, 18 vol % Magpie, and 15 vol % Seria Land Heavy.

Cinta, Indonesia

SBM and floating storage barge in Java Sea producing area

Crude
Gravity, °API: 33.4
Sulfur, wt %: 0.075
Pour pt, °F.: 105
Vis., cSt @ 100° F.: 64.34
Rvp, lb: 1.4
V/Ni, ppm: 0.1/9.5
Wax content, wt %: 30.3
C_5 & lighter, vol %: 3.143

Light naphtha
Range, °F.: C_5-180
Yield, vol %: 1.89
Sulfur, ppm: 2.3
RON, clear: 61.0
RON + 3 ml TEL/gal: 84.8

Naphtha
Range, °F.: 180-300
Yield, vol %: 4.84
Sulfur, ppm: 5.1
RON, clear: 48.4
RON + 3 ml TEL/gal: 74.4
Paraffins, vol %: 55.2
Olefins, vol %: 0.9
Naphthenes, vol %: 39.0
Aromatics, vol %: 4.9

Heavy naphtha
Range, °F.: 300-380
Yield, vol %: 4.02
Gravity, °API: 53.3
Sulfur, ppm: 12.0
P/O/N/A, vol %: 67.6/1.7/22.6/8.1

Kerosine
Range, °F.: 380-450
Yield, vol %: 2.04
Gravity, °API: 48.6
Sulfur, ppm: 91.4
Smoke pt, mm: 34
Pour pt, °F.: -30
Aniline pt, °F.: 156.7
Aromatics (FIA), %: 8.4
Cetane no.: 46.5
Diesel index: 76.2

Gas oil
Range, °F.: 450-650
Yield, vol %: 11.99
Gravity, °API: 42.2
Sulfur, wt %: 0.04
Cetane number: 58.5
Pour pt, °F.: 15
Vis., cSt @ 100° F.: 2.74

Heavy gas oil
Range, °F.: 650-1,050
Yield, vol %: 40.06
Gravity, °F.: 34.7
Sulfur, wt %: 0.065
Con. carbon, wt %: 0.07
Total nitrogen, wt %: 0.15
Basic nitrogen, wt %: 0.009
V/Ni, ppm: 0.1/0.1
Pour pt, °F.: 115
Aromatics (FIA), %: 15.6
Vis., cSt @ 130° F.: 10.0

Residue
Range, °F.: 650+
Yield, vol %: 74.3
Gravity, °API: 27.6
Sulfur, wt %: 0.09
Con. carbon, wt %: 6.05
V/Ni, ppm: 0.1/2.3
Pour pt, °F.: >120
Total nitrogen, wt %: 0.25
Vis., cSt @ 130° F.: 123.7

Daqing, China (see Taching)

Duri (Sumatran Heavy), Sumatra, Indonesia

Port of Dumai, Sumatra

Crude
Gravity, °API: 21.1
Sulfur, wt %: 0.20
Vis., cSt @ 122° F.: 131.9
Pour pt, °F.: 54
C_4 & lighter, vol %: 0.02

Light naphtha
Range (TBP), °F.: C_5-200
Yield, vol %: 0.48
Gravity, °API: 70.7
Sulfur, wt %: 0.007
Paraffins, vol %: 66.1
Naphtha, vol %: 33.5
Aromatics, vol %: 0.4

Heavy naphtha
Range (TBP), °F.: 200-340
Yield, vol %: 3.2
Gravity, °API: 51.1
Sulfur, wt %: 0.009
P/N/A, vol %: 31/62/7

Kerosine
Range (TBP), °F.: 340-460
Yield, vol %: 6.0
Gravity, °API: 36.3
Sulfur, wt %: 0.039
Smoke pt, mm: 18
Freeze pt, °F.: -73

Gas oil
Range (TBP), °F.: 460-650
Yield, vol %: 14.7
Gravity, °API: 27.4
Sulfur, vol %: 0.136
Pour pt, °F.: -1
Diesel index: 37.9

Reduced crude
Range (TBP), °F.: 650+
Yield, vol %: 75.6
Gravity, °API: 17.6
Sulfur, wt %: 0.21
Pour pt, °F.: 86
Vis., cSt @ 122° F.: 1,134
Rams. carbon, wt %: 7.8
V/Ni/Fe, wt % ppm: 1/16/0

Handil, Kalimantan, Indonesia

SBM about 6 miles offshore 27 miles northeast of Balikpapan

Crude
Gravity, °API: 32.75
Sulfur, wt %: 0.079
Pour pt, +85 °F
Rvp, psi: 1.6
Vis., cSt @ 37.8° C.: 4.2
Con. carbon, wt%: 1
V/Ni, ppm: <0.5/<1
C_4 & lighter, wt %: 0.5

Gasoline
Range, °C: C_5—75
Yield, wt %: 2.2
Gravity, °API: 69.4
Sulfur, ppm: 5
Paraffins, vol %: 64
Naphthenes, vol %: 20.2
Aromatics, vol %: 15.8
RON, clear: 79.7
RON + 0.6 g TEL/l: 89.2

Naphtha
Range, °C: 75-145
Yield, wt %: 11.4
Gravity, °API: 45.8
Sulfur, ppm: 9
P/N/A, vol %: 21.8/33.3/44.9

Kerosine
Range, °C: 145-250
Yield, wt %: 19.3
Gravity, °API: 33.6
Sulfur, ppm: 136
Aromatics (FIA), vol %: 44.2
Smoke pt, mm: 9
Freezing pt, °C: −49

Gas oil
Range, °C: 145-350
Yield, wt %: 46.3
Gravity, °API: 31.6
Sulfur, wt %: 0.061
Vis., cSt @ 20° C: 2.49
Aniline pt, °C: 51.8
Pour pt, °C: −7

Residue
Range, °C: 350+
Yield, wt %: 39.6
Gravity, °API: 25.1
Sulfur, wt %: 0.13
Vis., cSt @ 50° C: 46.7
Pour pt, °C: +45
Con. carbon, wt %: 2.6
V/Ni, ppm: <1/<2

Jatibarang, Java, Indonesia

SBM terminal about 6.5 nautical miles off north coast of Java

Crude
Gravity, °API: 29.0
Vis., cSt @ 122° F: 83.8
Pour pt, °F: 110
Rvp @ 100° F, psi: 0.2
Sulfur content, wt %: 0.07
Wax content, wt %: 24.6
Con. carbon residue, wt %: 7.53
Charac. factor, K UOP: 12.5

Gasoline
Range, °C: Ibp-100
Yield, vol %: 3.6
RON, clear: 70.0

Naphtha
Range, °C: 100-175
Yield, vol %: 7.9
Paraffins, vol %: 46.0
Naphthenes, vol %: 43.0
Aromatics, vol %: 11.0

Kerosine
Range, °C: 175-250
Yield, vol %: 7.0
Smoke pt, mm: 21.0

Gas oil
Range, °C: 250-350
Yield, vol %: 13.1
Diesel index: 67.5

Residue
Range, °C: 350+
Yield, vol %: 68.4
Sulfur, wt %: 11.0
Pour pt, °F: 120

Labuan Blend, Sabah, Malaysia

SBM in South China Sea off Labuan Island terminal

Crude
Gravity, °API: 33.2
Vis., cSt @ 70° F: 4.41
Pour pt, °F: 52
Sulfur, ppm: 917
Neut. no., mg KOH/g: 0.30
Rvp, psi: 3.52
Con. carbon residue, wt %: 2.54
V/Ni, ppm: 0.015/<0.002
Wax content, wt %: 2.34
Asphaltene content, wt %: 0.22
C_5 & lighter, wt %: 1.3

Light naphtha
Range, °F: C_5-145
Yield, vol %: 2.0
Sulfur, ppm: <5
Rvp, psi: 12.4

Heavy naphtha
Range, °F: 145-330
Yield, vol %: 18.80
Sulfur, ppm: 20
RON, clear: 67.0
RON + 3 cc TEL/U.S. gal: 85.0
Paraffins, wt %: 17.52
Naphthenes, wt %: 74.58
Aromatics, wt %: 7.89

Kerosine
Range, °F: 330-450
Yield, vol %: 18.00
Gravity, °API: 38.70
Sulfur, ppm: 140
Freezing pt, °F: −81.4
Pour pt, °F: <−17
Smoke pt, mm: 21
Cetane index: 34.39
Diesel index: 44

Distillate
Range, °F: 450-650
Yield, vol %: 38.27
Gravity, °API: 29.27
Sulfur, wt %: 0.07
Cloud pt, °F: 19.4
Cetane index: 40.09
Diesel index: 38
Aniline pt, °C: 55
Con. carbon residue, wt %: nil
Vis., cSt @ 70° F: 6.43

Residue
Range, °F: 650+
Yield, vol %: 21.96
Sulfur, wt %: 0.15
Nitrogen, ppm: 531
Pour pt, °F: 89.6
Con. carbon residue, wt %: 1.62
V/Ni, ppm: 0.03/0.08
Vis., cSt @ 100° F: 125.8

Heavy gas oil
Range, °F: 680-975
Yield, vol %: 16.83
Gravity, °API: 15.79
Sulfur, wt %: 0.14
Total nitrogen, ppm: 586
Basic nitrogen, ppm: 144
Pour pt, °F: 98
Con. carbon residue, wt %: 0.30
Vis., cSt @ 100° F: 173.61

Note: Labuan Blend comes from offshore fields connected to North Sabah Trunk Line. They include Samarang and South Furious. Erb West, St. Joseph and Barton were to be added during late 1983.

Minas (Sumatran Light), Sumatra, Indonesia

Port of Dumai, Sumatra

Crude
Gravity, °API: 34.5
Sulfur, wt %: 0.081
Vis., cSt @ 122° F: 12.4
Pour pt, °F: 97
C_4 & lighter, vol %: 0.27

Light naphtha
Range (TBP), °F: C_5-200
Yield, vol %: 2.83
Gravity, °API: 80.0
Sulfur, wt %: 0.001
Paraffins, vol %: 75
Naphtha, vol %: 25
Aromatics, vol %: nil

Heavy naphtha
Range (TBP), °F: 200-340
Yield, vol %: 9.4
Gravity, °API: 60.2
Sulfur, wt %: 0.002
P/N/A, vol %: 62/30/8

Kerosine
Range (TBP), °F: 340-460
Yield, vol %: 10.5
Gravity, °API: 47.2
Sulfur, wt %: 0.015
Smoke pt, mm: 35
Freeze pt, °F: −34

Gas oil
Range (TBP), °F: 460-650
Yield, vol %: 20.2
Gravity, °API: 39.6
Sulfur, vol %: 0.061
Pour pt, °F: 44
Diesel index: 72

Reduced crude
Range (TBP), °F: 650+
Yield, vol %: 56.8
Gravity, °API: 26.5
Sulfur, wt %: 0.15
Pour pt, °F: 106
Vis., cSt @ 122° F: 101.2
Rams. carbon, wt %: 5.1
V/Ni/Fe, wt % ppm: 1/15/10

Miri Light, Sarawak, Malaysia

SBMs off Miri terminal

Crude
Gravity, °API: 36.27
Vis., cSt @ 70° F: 3.65
Pour pt, °F: 34
Sulfur, ppm: 825
Total nitrogen, wt %: 0.0137
Neut. no., mg KOH/g: 0.175
Rvp, psi: 4.7
Con. carbon residue, wt %: 2.94
V/Ni, ppm: 0.012/<0.002
Wax content, wt %: 2.83
Asphaltene content, wt %: 0.258
C_5 & lighter, wt %: 2.2

Light naphtha
Range, °F.: C_5-145
Yield, vol %: 1.60
Sulfur, ppm: <5
Rvp, psi: 10.5

Heavy naphtha
Range, °F.: 145-330
Yield, vol %: 23.10
Sulfur, ppm: 17
RON, clear: 66.5
RON + 3 cc TEL/U.S. gal: 84.5
Paraffins, wt %: 14.55
Naphthenes, wt %: 68.94
Aromatics, wt %: 16.51

Kerosine
Range, °F.: 330-450
Yield, vol %: 15.80
Sulfur, ppm: 125
Freezing pt, °F.: < −70
Gravity, °API: 40.65
Smoke pt, mm: 21
Cetane index: 35.3
Diesel index: 47

Light distillate
Range, °F.: 450-650
Yield, vol %: 33.09
Gravity, °API: 30.99
Sulfur, ppm: 600
Cetane index: 41.1
Diesel index: 43
Aniline pt, °C.: 60
Vis., cSt @ 70° F.: 6.23

Residue
Range, °F.: 650+
Yield, vol %: 25.26
Gravity, °API: 21.01
Sulfur, wt %: 0.17
Pour pt, °F.: 100.4
Con. carbon residue, wt %: 2.22
V/Ni, ppm: 0.030/<0.001
Vis., cSt @ 100° F.: 217.26

Heavy gas oil
Range, °F.: 680-975
Yield, vol %: 20.26
Gravity, °API: 20.71
Sulfur, ppm: 0.15
Total nitrogen, ppm: 584
Basic nitrogen, ppm: 95
Pour pt, °F.: 35
Vis., cSt @ 100° F.: 103.85

Note: Miri is blend of 7 offshore fields. Miri Land crude no longer produced.

Pulai, Malaysia

Piped ashore to terminal north of Chukai, Kuala Trengganu area, peninsular Malaysia, as part of Tapis Blend.

Crude
Gravity, °API: 42.52
Vis., cSt @ 70° F.: 2.12
Pour pt, °F.: 23
Sulfur, ppm: 160
Total nitrogen, ppm: 33.5
Rvp, psi: 2.7
Con. carbon residue, wt %: 0.11
V/Ni, ppm: 1.4/0.1
Wax content, wt %: 3.11
Asphaltene content, wt %: 0.31
C_4 & lighter, vol %: 0.45

Light naphtha
Range, °F.: C_5-145
Yield, vol %: 2.03
Sulfur, ppm: <5

Heavy naphtha
Range, °F.: 145-330
Yield, vol %: 27.93
Sulfur, ppm: <5
RON, clear: <70
Paraffins, wt %: 31.83
Naphthenes, wt %: 26.44
Aromatics, wt %: 31.38

Kerosine
Range, °F.: 330-450
Yield, vol %: 27.85
Sulfur, ppm: 19
Freezing pt, °F.: −67
Pour pt, °F.: −66
Smoke pt, mm: 21
Cetane index: 43.17
Diesel index: 56.62
Vis., cSt @ 70° F.: 1.71

Light distillate
Range, °F.: 450-650
Yield, vol %: 34.14
Gravity, °API: 34.8
Sulfur, ppm: 270
Cloud pt, °F.: +14
Cetane index: 48.63
Diesel index: 54.04
Aniline pt, °C.: 68.5
Vis., cSt @ 70° F.: 5.01

Residue
Range, °F.: 650+
Yield, vol %: 7.60
Gravity, °API: 28.20
Sulfur, ppm: 800
Nitrogen, ppm: 323
Pour pt, °F.: 102
Aniline pt, °C.: 91
Con. carbon residue, wt %: 1.58
V/Ni, ppm: <0.01/<0.01
Vis., cSt @ 130° F.: 17.53
Note: Pulai is contributor to Tapis Blend

Salawati, West Irian, Indonesia

Salawati marine terminal (breasting and mooring dolphins and storage barge) on Sele Strait

Crude
Gravity, °API: 38.0
Vis., cSt @ 100° F.: 4.2
Pour pt, °F.: −15
Rvp @ 100° F., psi: 0.6
Sulfur, wt %: 0.49
Wax content, wt %: 8.42
Con. carbon residue, wt %: 1.3
Charac. factor K UOP: 12.0

Gasoline
Range, °C.: C_5-94
Yield, vol %: 1.0

Naphtha
Range, °C.: 94-149
Yield, vol %: 10.7
Paraffins, vol %: 71.4
Naphthenes, vol %: 27.9
Aromatics, vol %: 0.8

Kerosine
Range, °C.: 149-260
Yield, vol %: 35.4
Smoke pt, mm: 35.5
Freezing pt, °F.: −28

Gas oil
Range, °C.: 260-344
Yield, vol %: 21.5
Cetane index: 58.6

Residue
Range, °C.: 344+
Yield, vol %: 31.4
Sulfur, wt %: 1.1
Pour pt, °F.: 115

Sanga Sanga, Kalimantan, Indonesia

Crude
Gravity, °API: 25.7
Rvp, psi @ 100° F.: 0.8
Sulfur, wt %: 0.17
Pour pt, °F.: +5
V/Ni, ppm: nil/0.9
Vis., SUS @ 100° F.: 151.3
Con. carbon residue, wt %: 0.79

Naphtha
Range, °F.: Ibp-350
Yield, vol %: 13.2
Rvp, psi @ 100° F.: 2.7
Sulfur, wt %: 0.015

Kerosine
Range, °F.: 350-450
Yield, vol %: 12.4
Aniline pt, °C.: 118
Sulfur, wt %: 0.04
Smoke pt, mm: 16

Diesel
Range, °F.: 450-650
Yield, vol %: 41.6
Gravity, °API: 25.3
Aniline pt, °C.: 133
Cetane index (calc.): 36.5
Sulfur, wt %: 0.13
Pour pt, °F.: +25
Vis., SUS @ 100° F.: 41.6

Fuel oil
Range, °F.: 650+
Yield, vol %: 32.8
Gravity, °API: 19.3
Sulfur, wt %: 0.31
Pour pt, °F.: +105
V/Ni, ppm: Nil/1.4

Sepinggan-Yakin Mixed (4:1), East Kalimantan, Indonesia

Lawi-Lawi terminal about 12 miles south of Balikpapan/SBM about 6 miles offshore in Makasar Straits

Crude
Gravity, °API: 31.7
Vis., cSt @ 100° F.: 3.16
Pour pt, °F.: 20
Rvp, psi @ 100° F.: 2.6
Total acid no., mg KOH/g: 0.3
Sulfur content, wt %: 0.11
Con. carbon residue, wt %: 0.54

Gasoline
Range, °C.: C_5-100
Yield, vol %: 1.5

Naphtha
Range, °C.: 100-175
Yield, vol %: 19.5

Kerosine
Range, °C.: 175-250
Yield, vol %: 21.5

Gas oil
Range, °C.: 250-350
Yield, vol %: 35.5

Fuel oil
Range, °C.: 350+
Yield, vol %: 22.0

Seria Light, Brunei

Lutong terminal

Crude
Gravity, °API: 36.2
Rvp, psi: 6.0
Sulfur, wt %: 0.07
Pour pt, °F.: 35
Vis., SSU @ 80° F.: 36.5
Yield, Ibp-113° F., vol %: 5.77

Gasoline
Range, °F.: 113-220
Yield, vol %: 10.23
RON + 3 cc TEL/gal: 85.0

Naphtha
Range, °F.: 220-390
Yield, vol %: 21.41
Paraffins, vol %: 35.9
Naphthenes, vol %: 34.6
Dinaphthenes, vol %: 11.8
Aromatics, vol %: 17.7

Light distillate
Range, °F.: 390-550
Yield, vol %: 26.63
Gravity, °API: 33.0
Cetane index: 35.0
Sulfur, wt %: 0.04
Aniline pt, °F.: 129.5
Pour pt, °F.: −35
Range, °F.: 550-650
Yield, vol %: 13.88
Gravity, °API: 29.0

Light gas oil
Range, °F.: 450-650
Yield, vol %: 31.74
Gravity, °API: 30.1
Cetane index: 40.7
Sulfur, wt %: 0.07

Heavy gas oil
Range, °F.: 650-971
Yield, vol %: 18.89
Gravity, °API: 18.0
Sulfur, wt %: 0.15
Total nitrogen, ppm: 513
Basic nitrogen, ppm: 262
Pour pt, °F.: 95
Carbon residue, wt %: 0.18

Vacuum flashed residue
Range, °F.: 971+
Yield, vol %: 3.19
Gravity, °API: 10.0
Sulfur, wt %: 0.32

Shengli, China

Qingdao terminal on Yellow Sea

Crude
Gravity, °API: 24.2
Rvp, psi: 0
Sulfur, wt %: 1.00
Pour pt, °F.: +70
Vis., SFS @ 122° F.: 48.3
Acid no.: 1.16

Light ends
Range, °F.: Ibp-160
Yield, vol %: 2.0

Light naphtha
Range, °F.: 160-290
Yield, vol %: 3.3
Paraffins, vol %: 45.9
Naphthenes, vol %: 44.7
Aromatics, vol %: 9.4

Heavy naphtha
Range, °F.: 290-390
Yield, vol %: 3.7
Gravity, °API: 47.5
Sulfur, wt %: 0.05
P/N/A, vol %: 48.9/30.9/20.2

Kerosine
Range, °F.: 390-500
Yield, vol %: 6.2
Gravity, °API: 39.9
Sulfur, wt %: 0.23
Olefins, vol %: 0.9
Aromatics, vol %: 16.5
Smoke pt, mm: 17
Freeze pt, °F.: −29.2

Diesel
Range, °F.: 500-660
Yield, vol %: 12.3
Gravity, °API: 34.7
Sulfur, wt %: 0.53
Pour pt, °F.: +40
Cetane index: 52.6
Cloud pt, °F.: +42

Light gas oil
Range, °F.: 660-780
Yield, vol %: 9.7
Gravity, °API: 31.4
Sulfur, wt %: 0.65
Vis., SSU @ 100° F.: 76.0
Pour pt, °F.: +80
Aniline pt, °F.: 183.0
UOP K factor: 12.1
Carbon residue, wt %: 0.06

Heavy gas oil
Range, °F.: 780-1,050
Yield, vol %: 26.4
Gravity, °API: 24.8
Sulfur, wt %: 0.79
Vis., SSU @ 210° F.: 78.3
Pour pt, °F.: +110
Aniline pt, °F.: 202.0
Carbon residue, wt %: 0.28

Bottoms
Range, °F.: 1,050+
Yield, vol %: 36.4
Gravity, °API: 11.7
Sulfur, wt %: 1.66
Vis., SSF @ 210° F.: 1,097.8
Carbon residue, wt %: 16.4

Soviet Export Blend, U.S.S.R.

Terminals: Ventspils, Baltic and Novorossysk, Black Sea

Crude
Gravity, °API: 32.5
Sulfur, wt %: 1.38
Rvp, kPa: 49.2
Pour pt, °C: −23
Vis. @ 20° C.: 11.5

Light naphtha
Range (TBP), °C.: Ibp-90
Yield, wt %: 10.3
Density @ 15° C., g/ml: 0.676
Sulfur, wt %: 0.005
Paraffins, wt %: 71.7
Naphthenes, wt %: 26.5
Aromatics, wt %: 1.8

Heavy naphtha
Range (TBP), °C.: 90-180
Yield, wt %: 11.3
Density @ 15 °C., g/ml: 0.761
Sulfur, wt %: 0.029
P/N/A, vol %: 38.5/52.0/9.5

Kerosine
Range (TBP), °C.: 180-220
Yield, wt %: 6.5
Density @ 15 °C., g/ml: 0.806
Sulfur, wt %: 0.15
Aromatics, vol %: 20.1
Freeze pt, °C.: −57
Smoke pt, mm: 25
Aniline pt, °C.: 62.5
Vis., cSt @ 20° C.: 1.73

Light gas oil
Range (TBP), °C.: 180-350
Yield, wt %: 24.3
Density @ 15° C., g/ml: 0.840
Cetane index (calc.): 49.5
Sulfur, wt %: 0.57
Pour pt, °C.: −29
Aniline pt, °C.: 67.5
Vis., cSt @ 20° C.: 3.69

Heavy gas oil
Range (TBP), °C.: 350-515
Yield, wt %: 29.4
Density @ 15° C., g/ml: 0.915
Sulfur, wt %: 1.9
Vis., cSt @ 50° C.: 26.0
V/Ni, ppm: 0.15/0.17

Long residuum
Range, °C.: 350
Yield, wt %: 54.1
Density @ 15° C., g/ml: 0.952
Sulfur, wt %: 2.59
Rams. carbon, wt %: 8.2
Vis., cSt @ 50° C.: 191

Short residuum
Range, °C.: 515
Yield, wt %: 26.4
Sulfur, wt %: 2.98
Rams. carbon, wt %: 16.4
Vis. @ 60° C.: 3.9
V/Ni, ppm: 154/53

Note: Crude on which this assay was based was shipped from Ventspils. It is claimed that crude from either port is of similar quality.

Taching (Daqing), China

Luda (Darien) terminal on Yellow Sea

Crude
Gravity, °API: 33.0
Sulfur, wt%: 078
Pour pt, °F: +95

Light ends
Range, °F.: Ibp-160
Yield, vol %: 1.8

Light naphtha
Range, °F.: 160-290
Yield, vol %: 5.4
Sulfur, wt %: 0.0130
Paraffins, vol %: 46.6
Olefins, vol %: 0.4
Naphthenes, vol %: 50.4
Aromatics, vol %: 2.6

Heavy naphtha
Range, °F.: 290-390
Yield, vol %: 5.8

Sulfur, wt %: 0.010
P/O/N/A, vol %: 39.6/1.5/52.4/6.5

Kerosine
Range, °F.: 390-500
Yield, vol %: 7.7
Gravity, °API: 44.0
Sulfur, wt %: 0.0127
Olefins, vol %: 3.2
Aromatics, vol %: 11.1
Smoke pt, mm: 22
Freezing pt, °F.: −13.9

Diesel
Range, °F.: 500-635
Yield, vol %: 7.2
Gravity, °API: 39.2
Sulfur, wt %: 0.0390
Vis., SSU @ 100° F.: 40.2
Pour pt, °F.: +40
Aniline pt, °F.: 178.0
Diesel index: 69.8

Light gas oil
Range, °F.: 635-775
Yield, vol %: 16.3
Gravity, °API: 37.0
Sulfur, wt %: 0.0480
Vis., SSU @ 100° F.: 52.1
Pour pt, °F.: +80
Carbon residue, wt %: 0.01

Heavy gas oil
Range, °F.: 775-932
Yield, vol %: 18.9
Gravity, °API: 31.4
Sulfur, wt %: 0.1140
Vis., SSU @ 210° F.: 48.1
Pour pt, °F.: +115
UOP K factor: 12.5
Carbon residue, wt%: 0.03

Bottoms
Range, °F.: 932+
Yield, vol %: 36.9
Gravity, °API: 21.2
Sulfur, wt %: 0.14
Vis., SSF @ 210° F.: 52.2
Carbon residue, wt %: 7.3
V/Ni, ppm: 1.0/0

Tapis, Malaysia

Piped ashore to terminal north of Chukai, Kuala Trengganu area, peninsular Malaysia, as part of Tapis Blend

Crude
Gravity, °API: 44.30
Vis., cSt @ 70° F.: 2.69
Pour pt, °F.: 39
Sulfur, ppm: 230
Total nitrogen, ppm: 134
Basic nitrogen, ppm: 10.1
Neut. no., mg KOH/g: 0.04
Rvp, psi: 2.5
Con. carbon residue, wt %: 2.17
V/Ni, ppm: <0.002/0.17
Wax content, wt %: 5.75
Asphaltene content, wt %: 0.112
Yield, C_4 & lighter, vol %: 0.97

Light gasoline
Range, °F.: C_5-145
Yield, vol %: 2.97
Sulfur, ppm: <5
Rvp, psi: 10.4
RON, clear: 74
RON + 3 cc TEL/U.S. gal: 92.5
Paraffins, wt %: 84.15
Naphthenes, wt %: 13.22
Aromatics, wt %: 2.63

Heavy naphtha
Range, °F.: 145-330
Yield, vol %: 23.47
Sulfur, ppm: 13
RON, clear: 53
P/N/A, wt %: 40.26/31.08/28.66

Kerosine
Range, °F.: 330-450
Yield, vol %: 20.70
Sulfur, ppm: 23
Freezing pt, °F.: −40
Smoke pt, mm: 20
Cetane index: 55.87
Diesel index: 74

Light distillate
Range, °F.: 450-650
Yield, vol %: 34.27
Gravity, °API: 41.0
Sulfur, ppm: 135
Cetane index: 61.9
Aniline pt, °C.: 79.5
Vis., SUS @ 70° F.: 41.35

Residue
Range, °F.: 650+
Yield, vol %: 17.62
Gravity, °API: 29.58
Sulfur, ppm: 700
Pour pt, °F.: 108
Con. carbon residue, wt %: 2.024
V/Ni, ppm: 0.31/0.01
Vis., SUS @ 130° F.: 102.31

Note: Tapis is contributor to Tapis Blend

Tapis Blend, Malaysia

Piped ashore to terminal north of Chukar, Kuala Trengganu area, peninsular Malaysia

Tapis Blend comprises oil from six fields in the South China Sea. They are Tapis, Pulai, Bekok, Tiong, Tingge, and Kepong. The latter three fields only recently began contributing to blend and assays had not yet been run at mid 1983. Tapis crude originally made up 60% of blend, Pulai and Bekok 40%. Assays are presented for these three crudes.

Tembungo, Sabah, Malaysia

Production platform in offshore producing area

Crude
Gravity, °API: 37.4
Sulfur, wt %: 0.04
Pour pt, °F.: +25
Vis., cSt @ 100° F.: 2.0
Rvp, psi: 2.8
Salt content, lb/1,000 bbl: 2.3

Light naphtha
Range, °F.: C_5-160
Yield, vol %: 2.4
Gravity, °API: 81.0
Sulfur, wt %: 0.001
Rvp, psi: 12.6
Paraffins, vol %: 83.0
Naphthenes, vol %: 17.0
Aromatics, vol %: Nil

Heavy naphtha
Range, °F.: 160-300
Yield, vol %: 17.9
Gravity, °API: 53.0
Sulfur, wt %: 0.004
Paraffins, vol %: 27.0
Naphthenes, vol %: 59.0
Aromatics, vol %: 14.0

Light distillate
Range, °F.: 300-510
Yield, vol %: 35.7
Gravity, °API: 36.0
Sulfur, wt %: 0.04
Freeze point, °F.: −45 est.
Smoke pt, mm: 13.0
Paraffins, vol %: 30.0
Naphthenes, vol %: 36.0
Aromatics, vol %: 34.0

Heavy distillates
Range, °F.: 510-650
Yield, vol %: 28.9
Gravity, °API: 33.0
Sulfur, wt %: 0.06
Pour pt, °F.: +15.0
Aniline pt, °F.: 153.0
Diesel index: 50.5

Resid
Range, °F.: 650+
Yield, vol %: 13.5
Gravity, °API: 25.0
Sulfur, wt %: 0.14
Pour pt, °F.: 85.0
Vis., cSt @ 100° F.: 42.0
Con. carbon, wt %: 0.55

Udang, Natuna Sea, Indonesia

Storage vessel with SBM about 43 nautical miles north of Anambas Island

Crude
Gravity, °API: 38.0
Kin. vis. @ 130° F.: 8.71
Con. carbon residue, wt %: 3.0
Sulfur, wt %: 0.05
V/Ni, ppm: 0.9/3.5
Pour pt, °C.: +37.8
Rvp, psi: nil
C_4 & lighter, vol %: 0.36

Naphtha
Range (TBP), °F.: 90-375
Yield, vol %: 15.2
Gravity, °API: 63.3
Paraffins, vol %: 75.5
Naphthenes, vol %: 20.3
Sulfur, wt %: <0.005

Kerosine
Range, °F.: 375-520
Yield, vol %: 11.4
Gravity, °API: 47.7
Sulfur, wt %: 0.005
Aromatics, vol %: 6

Heavy distillate
Range, °F.: 520-700
Yield, vol %: 18.7
Gravity, °API: 41.6
Sulfur, wt %: 0.02

Gas oil
Range, °F.: 700-1,010
Yield, vol %: 34.6
Gravity, °API: 35.4
Sulfur, wt %: 0.04

Residue
Range, °F.: 1,010+
Yield, vol %: 19.7
Gravity, °API: 20.9
Sulfur, wt %: 0.10
Kin. vis. @ 210° F.: 150
Con. carbon residue, wt %: 12.2
V/Ni, ppm: 4/16

Walio, West Irian, Indonesia

Kasim marine terminal (CBM) between island of Jef Kasim and mainland Irian Jaya

Crude
Gravity, °API: 34.05
Vis., cSt @ 100° F.: 5.0
Rvp @ 100° C., psi: 3.7
Acid no., mg KOH/g: 0.30
Con. carbon residue, wt %: 2.18
Charac. factor K UOP: 11.7

Gasoline
Range, °C.: C_5-95
Yield, vol %: 4.5

Naphtha
Range, °C.: 95-185
Yield, vol %: 19.0
Paraffins, vol %: 63.3
Naphthenes, vol %: 30.7
Aromatics, vol %: 6.0

Kerosine
Range, °C.: 185-260
Yield, vol %: 16.7
Smoke pt, mm: 22.0
Freezing pt, °C.: −46

Gas oil
Range, °C.: 260-350
Yield, vol %: 20.0
Diesel index: 56.1

Fuel oil
Range, °C.: 350+
Yield, vol %: 39.8
Sulfur, wt %: 1.36
Pour pt, °F.: 100

Latin America

BCF 24, Venezuela

La Salina, Lake Maracaibo

Crude
Gravity, °API: 23.5
Sulfur, wt %: 1.85
Vis., SUS @ 100° F.: 192.2
Pour pt, °F.: −60
Yield, 0°(IVT) - −82° F., vol %: 1.53

Light naphtha
Range, °F.: 82-200
Yield, vol %: 3.80
Sulfur, wt %: 0.0011
Paraffins, %: 71.37
Naphthenes, %: 26.70
Aromatics, %: 1.93

Heavy naphtha
Range, °F.: 200-300
Yield, vol %: 5.0
Sp gr: 0.7565
Sulfur, wt %: 0.0066
P/N/A, %: 48.24/39.87/11.89
RON clear: 65.4

Naphtha
Range, °F.: 300-350
Yield, vol %: 2.82
P/N/A, %: 41.95/42.21/15.84

Kerosine
Range, °F.: 350-400
Yield, vol %: 3.14
P/N/A, %: 37.59/44.45/17.95
Sulfur, wt %: 0.1186
Freeze pt, °F.: −91.39
Smoke pt, mm: 22.25
Cetane no.: 46.06
Aniline pt, °F.: 128.05

Gas oil
Range, °F.: 400-500
Yield, vol %: 7.53
Gravity, °API: 37.37
Sulfur, wt %: 0.3027
Kin. vis. @ 122° F.: 1.51
Freeze pt, °F.: −63.27
Smoke pt, mm: 19.33
Aniline pt, °F: 136.44
Cetane no.: 42.20

Gas oil
Range, °F.: 500-550
Yield, vol %: 4.55

Gas oil
Range, °F.: 550-650
Yield, vol %: 9.73
Sulfur, wt %: 1.06
Gravity, °API: 29.07
Kin. vis. @ 122° F.: 4.62
Pour pt, °F.: 4.13
Smoke pt, mm: 7.22
Aniline pt, °F.: 150.73

Residue
Range, °F.: 650+
Yield, vol %: 61.91
Gravity, °API: 13.26
Sulfur, wt %: 2.58
Kin. vis. @ 122° F.: 2,295
Ni/V, ppm: 40/347

Bachaquero, Venezuela

La Salina, Lake Maracaibo

Crude
Gravity, °API: 16.8
Sulfur, wt %: 2.4
Vis., SUS @ 100° F.: 1,362
Pour pt, °F.: −10
Rvp, psi: 1.6
Yield, 0° (IVT) - −82° F., vol %: 0.80

Light naphtha
Range, °F.: 82-200
Yield, vol %: 2.44
Sulfur, wt %: 0.0075
Paraffins, %: 66.17
Naphthenes, %: 31.28
Aromatics, %: 2.55
RON clear: 71.7

Heavy naphtha
Range, °F.: 200-300
Yield, vol %: 3.54
Sulfur, wt %: 0.026
P/N/A, wt %: 29.38/58.96/11.66
RON clear: 66.7

Naphtha
Range, °F. 300-350
Yield, vol %: 1.81
Sp gr: 0.8018
Sulfur, wt %: 0.1107
P/N/A, %: 23.20/59.59/17.21

Kerosine
Range, °F.:350-400
Yield, vol %: 2.11
Sp gr: 0.8227
Sulfur, wt %: 0.19
P/N/A, %: 25.12/54.49/20.39
Freeze pt, °F.: −74.12
Smoke pt, mm: 17.75
Cetane no.: 48.56

Gas oil
Range, °F.: 400-500
Yield, vol %: 6.37
Gravity, °API: 35.43
Sulfur, wt %: 0.52
Aromatics, wt %: 25.29
Freeze pt, °F.: −66.62
Smoke pt, mm: 9.23
Cetane no.: 46.36
Aniline pt., °F.: 127.39
Cetane index: 39.98

Gas oil
Range, °F.: 500-550
Yield, vol %: 3.93

Gas oil
Range, °F.: 550-650
Yield, vol %: 8.95
Sulfur, wt %: 1.36
Pour pt, °F.: −47.99
Smoke pt, mm: 2.83
Aniline pt, °F.: 138.64

Residue
Range, °F.: 650+
Yield, vol %: 70.24
Gravity, °API: 9.39
Sulfur, wt %: 3.0
Kin. vis. @ 122° F.: 8,672
Ni/V, ppm: 74/435

Boscan, Venezuela

Bajo Grande, Lake Maracaibo

Crude
Gravity, °API: 10.10
Sulfur, wt %: 5.5
Vis. SUS @ 100° F.: 90,000
Pour pt, °F.: +50

Light naphtha
Range, °F.: 82-200
Yield, vol %: 0.55

Heavy naphtha
Range, °F.: 200-300
Yield, vol %: 1.32
Sulfur, wt %: 0.68
Paraffins, %: 53.28

Naphtha
Range, °F.: 300-350
Yield, vol %: 0.88
Sulfur, wt %: 1.28
Paraffins, %: 34.9

Kerosine
Range, °F.: 350-400
Yield, vol %: 1.28
Sulfur, wt %: 1.88
Aromatics, %: 24.04
Pour pt, °F.: −141.0
Smoke pt, mm: 16.0
Aniline pt, °F.: 112.69

Gas oil
Range, °F.: 400-500
Yield, vol %: 3.96
Gravity, °API: 34.0
Sulfur, wt %: 3.14
Kin. vis. @ 122° F.: 1.81
Pour pt, °F.: −77.53
Smoke pt, °F.: 16.11

Aniline pt, °F.: 113.83
Cetane index: 37.24

Gas oil
Range, °F.: 500-550
Yield, vol %: 2.66
Gravity, °API: 28.62
Sulfur, wt %: 4.02

Gas oil
Range, °F.: 550-650
Yield, vol %: 6.46
Gravity, °API: 25.54
Sulfur, wt %: 4.47
Pour pt, °F.: −10.9
Cetane no.: 38.0
Aniline pt, °F.: 117.3
Cetane index: 42.27

Residue
Range, °F.: 650+
Yield, vol %: 82.9
Sulfur, wt %: 5.86
Gravity, °API: 6.10
Sulfur, wt %: 5.86
Ni/V, ppm: 175/1,407
Kin. vis. @ 122° F.: 22,502

Ceuta, Venezuela

Puerto Miranda, Lake Maracaibo

Crude
Gravity, °API: 31.8
Sulfur, wt %: 1.2
Vis., SUS @ 100° F.: 62
Pour pt, °F.: −35
Rvp: 2.7
Yield, 0°(IVT) - −82° F., vol %: 2.10

Light naphtha
Range, °F.: 82-200
Yield, vol %: 7.51
Sulfur, wt %: 0.002
Paraffins, %: 75.69
Naphthenes, %: 19.85
Aromatics, %: 4.46
RON clear: 71.5

Heavy naphtha
Range, °F.: 200-300
Yield, vol %: 9.89
Sulfur, wt %: 0.01
P/N/A, %: 50.88/32.07/17.05
RON clear: 60.9

Naphtha
Range, °F.: 300-350
Yield, vol %: 5.36
P/N/A, %: 42.25/38.78/18.98

Kerosine
Range, °F.: 350-400
Yield, vol %: 5.28
Gravity, °API: 44.1
Sulfur, wt %: 0.054
P/N/A, %: 39.8/41.1/19.0
Smoke pt, mm: 21.39
Aniline pt, °F.: 122.8
Cetane index: 40.9

Gas oil
Range, °F.: 400-500
Yield, vol %: 9.93
Gravity, °API: 38.75
Sulfur, wt %: 0.33
Aromotics, %: 19.10
Smoke pt, mm: 19.59
Aniline pt, °F.: 136.18
Cetane index: 41.84

Gas oil
Range, °F.: 500-550
Yield, vol %: 5.0
Gravity, °API: 34.64
Sulfur, wt %: 0.72

Gas oil
Range, °F.: 550-650
Yield, vol %: 9.24
Gravity, °API: 30.17
Sulfur, wt %: 1.0
Aniline pt, °F.: 155.8
Cetane index: 48.03

Residue
Range, °F.: 650+
Yield, vol %: 45.69
Gravity, °API: 16.60
Sulfur, wt %: 2.05
Ni/V, ppm: 54/281

Galeota Mix (Trinidad Blend), Trinidad Tobago

Point Galeota SBM

Crude
Gravity, °API: 32.8
Sulfur, wt %: 0.27
Rvp, psi: 2.0
Pour pt, °F.: −5
Neut. no., mg KOH/g: 0.84
Rams. carbon, wt %: 0.5
Kin. vis., cSt @ 100° F.: 4.32
V/Ni, ppm: 0/1
Yield C_4 & lighter, vol %: 0.6

Naphtha
Range, °F.: C_5-200
Yield, vol %: 3.7
Sulfur, wt %: 0.010
Paraffins, vol %: 63.1
Naphthenes, vol %: 30.5
Aromatics, vol %: 6.4
RON clear: 73.1

Heavy naphtha
Range, °F.: 200-320
Yield, vol %: 8.7
Sulfur, wt %: 0.017
P/N/A, vol %: 39.4/44.9/15.7
RON clear: 63.8

Kerosine
Range, °F.: 320-520
Yield, vol %: 28.8
Gravity, °API: 36.6
Sulfur, wt %: 0.054
Aniline pt, °F.: 126.7
Diesel index: 46.3
Cetane index: 35.6
Freeze pt, °F.: −56
Smoke pt, mm: 20

Gas oil
Range, °F.: 520-650
Yield, vol %: 25.6
Gravity, °API: 30.3
Sulfur, wt %: 0.223
Aniline pt, °F.: 151.0
Diesel index: 45.8
Cetane index: 44.6
Pour pt, °F.: 11

Gas oil
Range, °F.: 650-850
Yield, vol %: 20.1
Gravity, °API: 26.6
Sulfur, wt %: 0.454
Nitrogen, wt %: 0.030
Vis., SUS @ 122° F.: 77.8

Residue
Range, °F.: 650+
Yield, vol %: 32.8
Gravity, °API: 24.2
Sulfur, wt %: 0.607
Pour pt, °F.: +65
Nitrogen, wt %: 0.086
Rams. carbon, wt %: 1.35
Vis., SUS @ 122° F.: 200.3
V/Ni, ppm: 1/1

Isthmus, Mexico

Pajaritos, Veracruz, and Salina Cruz (Pacific), Oaxaca

Crude
Gravity, °API @ 60° F.: 32.8
Sulfur, wt %: 1.51
Pour test, °F.: −15
Vis., SUS @ 70° F.: 65.53
Vis., SUS @ 100° F.: 43.91
Rvp, psi @ 100° F.: 6.4
Hydrogen sulfide, ppm: 102
NC_4 & lighter, wt %: 1.2

Light straight run
Range, °F.: 60-200
Yield, vol %: 9.1
Total sulfur, wt %: 0.046
RON clear: 62.6
RON + 3 ml TEL/gal: 82.4

Naphtha
Range, °F.: 60-400
Yield, vol %: 29.9
Paraffins, vol %: 64.40
Naphthenes, vol %: 21.02
Aromatics, vol %: 14.58
Total sulfur, wt %: 0.054
RON clear: 44.5
RON + 3 ml TEL/gal: 67.0

Kerosine
Range, °F.: 400-500
Yield, vol %: 12.5
Gravity, °API: 41.2
Freezing point, °F.: −36
P/N/A, vol %: 47.4/30.9/21.7
Total sulfur, wt %: 0.23
Aniline pt, °F.: 143.2
Smoke pt, mm: 22

Light gas oil
Range, °F.: 500-650
Yield, vol %: 16.0
Gravity, °API: 32.3
Pour pt, °F.: +25
P/N/A, vol %: 41.2/33.3/25.5
Total sulfur, wt %: 1.19
Carbon residue, Rams., wt %: 0.01
Aniline pt, °F.: 156.3
Cetane index: 52.5

Topped crude
Range, °F.: 650+
Yield, vol %: 40.4
Gravity, °API: 15.5
Vis., SUS @ 210° F.: 145.47
Vis., SUS @ 122° F.: 149.53
Pour pt, °F.: +55
Total sulfur, wt %: 2.94
Carbon residue, Rams., wt %: 8.08
Nitrogen, %: 0.2065
Ni/V, ppm: 14.8/67.1

Vacuum gas oil
Range, °F.: 650-1,100+
Yield, vol % (of crude): 28.5
Gravity, °API: 19.7
Aniline pt, °F.: 181.1
Vis., SUS @ 130° F.: 207.09
Pour pt, °F.: +110
Sulfur, wt %: 2.45
Carbon residue, Rams., wt %: 0.97
Ni/V, ppm: 4.3/-

Vacuum residue
Range, °F.: 1,100+
Yield, vol % (of crude): 11.9
Gravity, °API: 4.2
Vis., SFS @ 275° F.: 235.8
Sulfur, wt %: 4.18
Carbon residue, wt %: 23.08
Ni/V, ppm: 37/210

Lagomedio, Venezuela

Punta Palmas, Puerto Miranda/La Salina, Lake Maracaibo

Crude
Gravity, °API: 31.50
Sulfur, wt %: 1.17
Vis., SUS @ 100° F.: 56
Pour pt, °F.: −15
Rvp: 5.3
Yield, 0°(IVT) - −82° F., vol %: 1.96

Light naphtha
Range, °F.: 82-200
Yield, vol %: 6.10
Paraffins, %: 77.35
Naphthenes, %: 20.38
Aromatics, %: 2.28
RON clear: 65.6

Heavy naphtha
Range, °F.: 200-300
Yield, vol %: 9.27
Sulfur, wt %: 0.0
P/N/A, %: 55.4/33.0/11.5

Naphtha
Range, °F.: 300-350
Yield, vol %: 5.0
P/N/A, %: 50.0/32.5/17.5

Kerosine
Range, °F.: 350-400
Yield, vol %: 4.95
Sulfur, wt %: 0.027
Aromatics, %: 19.5
Smoke pt, mm: 24.5
Cetane no.: 56.12
Cetane index: 47.2

Gas oil
Range, °F.: 400-500
Yield, vol %: 9.39
Gravity, °API: 40.65
Sulfur, wt %: 0.17
Aromatics, %: 19.7
Smoke pt, mm: 20.61
Cetane no.: 50.02
Aniline pt, °F.: 147.34
Cetane index: 50.3

Gas oil
Range, °F.: 500-550
Yield, vol %: 4.69
Gravity, °API: 36.9
Sulfur, wt %: 0.44

Gas oil
Range, °F.: 550-650
Yield, vol %: 9.49
Gravity, °API: 33.4
Sulfur, wt %: 0.78
Cetane no.: 54.81
Aniline pt, °F.: 166.46
Cetane index: 58.1

Residue
Range, °F.: 650+
Yield, vol %: 49.15
Gravity, °API: 18.16
Sulfur, wt %: 1.97
Ni/V, ppm: 20/180

La Rosa Medium, Venezuela

La Salina, Lake Maracaibo

Crude
Gravity, °API: 25.3
Sulfur, wt %: 1.73
Pour pt, °F.: <−50
Rvp, psi: 4.0
Neut. no., mg KOH/g: 0.90
Vis. kin., cSt @ 122° F.: 24.0
Yield, C_5 & lighter: 1.34

Distillation

°F.	**Yield, vol %:** On crude	Cum.
C_2-C_5	1.34	1.34
158	2.47	3.80
212	2.33	6.13
302	5.40	11.52
401	6.69	18.21
509	7.81	26.01
650	13.22	39.23
698	5.63	44.85
752	6.33	51.17
752+	48.83	100.00

Residue
Range, °F.: 752+
Yield, vol %: 48.83
Gravity, °API: 12.1
Sulfur, wt %: 2.63
Con. carbon, wt %: 12.85
V/Ni, ppm: 413/43
Kin. vis., cSt @ 140° F.: 2,397

Leona, Venezuela

Puerto La Cruz, State of Anzoategui

Crude
Gravity, °API: 24.1
Sulfur, wt %: 1.5
Vis., SUS @ 122° F.: 305
Pour pt, °F.: −45
Rvp: 5.5
Yield, 0°(IVT)-82° F., vol %: 0.99

Naphtha
Range, °F.: 82-200
Yield, vol %: 4.34
RON clear: 63.9

Heavy naphtha
Range, °F.: 200-300
Yield, vol %: 6.71
Sulfur, wt %: 0.005
Paraffins, %: 49.85
Naphthenes, %: 32.13
Aromatics, %: 18.01

Naphtha
Range, °F.: 300-350
Yield, vol %: 3.34

Kerosine
Range, °F.: 350-400
Yield, vol %: 3.39
Sulfur, wt %: 0.05
P/N/A, %: 34.6/43.9/21.5
Smoke pt, mm: 18.15
Cetane no.: 44.78
Aniline pt, °F.: 135.13
Cetane index: 43.23

Gas oil
Range, °F.: 400-500
Yield, vol %: 10.51
Gravity, °API: 36.39
Sulfur, wt %: 0.19
Smoke pt, mm: 16.14
Cetane no.: 50.18
Aniline pt, °F.: 149.11
Cetane index: 46.50

Gas oil
Range, °F.: 500-550
Yield, vol %: 5.31
Sulfur, wt %: 0.56

Gas oil
Range, °F.: 550-650
Yield, vol %: 10.32
Gravity, °API: 28.46
Sulfur, wt %: 0.92
Pour pt, °F.: 17.79

Residue
Range, °F.: 650+
Yield, vol %: 55.11
Gravity, °API: 12.28
Sulfur, wt %: 2.3
Ni/V, ppm: 26/176

Loreto, Peru

Puerto Bayovar

Crude
Gravity, °API: 34.0
Sulfur, wt %: 0.29
Pour pt, °F.: 34
Vis., SUS @ 80° F.: 53.3
V/Ni, ppm: 63/34

Light naphtha
Range, °C.: Ibp-45
Yield, vol %: 2.41

Naphtha
Range, °C.: 45-104
Yield, vol %: 7.11
Paraffins, vol %: 68.3
Naphthenes, vol %: 29.9
Aromatics, vol %: 1.8

Heavy naphtha
Range, °C.: 104-199
Yield, vol %: 18.24
P/N/A, vol %: 49.9/39.2/10.3

Kerosine
Range, °C.: 199-288
Yield, vol %: 18.95
Sulfur, wt %: 0.05
Pour pt, °C.: −37
Cetane index: 46.3

Residue
Range, °C.: 343+
Yield, vol %: 41.3
Gravity, °API: 18.9
Sulfur, wt %: 0.51

Maya, Mexico

Pajaritos, Veracruz and Salina Cruz (Pacific), Oaxaca

Crude
Gravity, °API @ 60° F.: 22.0
Sulfur, wt %: 3.32
Pour test, °F.: 0
Vis., SUS @ 70° F.: 1,024.57
Vis., SUS @ 100° F.: 333.62
Rvp, psi @ 100° F.: 4.7
Hydrogen sulfide, ppm: 199
NC_4 & lighter, vol %: 1.5

Light straight run
Range, °F.: 60-200
Yield, vol %: 5.2
Total sulfur, wt %: 0.025
RON clear: 57.7
RON + 3 ml TEL/gal: 80.9

Naphtha
Range, °F.: 60-400
Yield, vol %: 19.7
Paraffins, vol %: 60.60
Naphthenes, vol %: 27.03
Aromatics, vol %: 12.37
Total sulfur, wt %: 0.213
RON clear: 38.1
RON + 3 ml TEL/gal: 57.6

Kerosine
Range, °F.: 400-500
Yield, vol %: 9.6
Gravity, °API: 39.6
Freezing pt, °F.: –29
P/N/A, vol %: 45.4/33.7/20.9
Total sulfur, wt %: 1.16
Aniline pt, °F.: 142.2
Smoke pt, mm: 20

Light gas oil
Range, °F.: 500-650
Yield, vol %: 12.8
Gravity, °API: 30.6
Pour pt, °F.: +30
P/N/A, vol %: 36.8/34.1/29.1
Total sulfur, wt %: 2.17
Carbon residue, Rams., wt %: 0.08
Aniline pt, °F.: 152.8
Cetane index: 51.0

Topped crude
Range, °F.: 650+
Yield, vol %: 56.4
Gravity, °API: 7.7
Vis., SUS @ 210° F.: 3,370.63
Vis., SUS @ 122° F.: 23,755.00
Pour pt, °F.: +115
Total sulfur, wt %: 5.04
Carbon residue, Rams., wt %: 17.83
Nitrogen, %: 0.4245
Ni/V, ppm: 87.8/535.0

Vacuum gas oil
Range, °F.: 650-1,100+
Yield, vol % (of crude): 25.2
Gravity, °API: 18.3
Aniline pt, °F.: 167.4
Vis., SUS @ 130° F.: 270.17
Pour pt, °F.: +105
Sulfur, wt %: 3.14
Carbon residue, Rams., wt %: 0.69
Ni/V, ppm: 0.9/1.9

Vacuum residue
Range, °F.: 1,100+
Yield, vol % (of crude): 31.2
Gravity, °API: 0.5
Vis., SUS @ 275° F.: Too hard
Sulfur, wt %: 5.78
Carbon residue, Rams., wt %: 26.2
Ni/V, ppm: 149/913

Merey, Venezuela

Puerto La Cruz, State of Anzoategui

Crude
Gravity, °API: 17.4
Sulfur, wt %: 2.2
Vis., SUS @ 100° F.: 1,207
Pour pt, °F.: –10
Yield, 0°(IVT)-82° F., vol %: 0.54

Light naphtha
Range, °F.: 82-200
Yield, vol %: 1.61
RON clear: 74.7

Heavy naphtha
Range, °F.: 200-300
Yield, vol %: 3.21
Sulfur, wt %: 0.01
Paraffins, vol %: 43.9
Naphthenes, vol %: 41.55
Aromatics, vol %: 15.17

Naphtha
Range, °F.: 300-350
Yield, vol %: 1.91
Sulfur, wt %: 0.036
P/N/A, vol %: 43.19/42.30/14.50

Kerosine
Range, °F.: 350-400
Yield, vol %: 2.37
Sulfur, wt %: 0.09
Aromatics, vol %: 13.95
Smoke pt, mm: 21.37
Aniline pt, °F.: 126.6

Gas oil
Range, °F.: 400-500
Yield, vol %: 7.21
Gravity, °API: 34.89
Sulfur, wt %: 0.33
Aromatics, vol %: 17.10
Smoke pt, mm: 13.45
Cetane no.: 35.62
Aniline pt, °F.: 135.51
Cetane index: 38.94

Gas oil
Range, °F.: 500-550
Yield, vol %: 4.52
Gravity, °API: 30.82
Sulfur, wt %: 0.7037

Gas oil
Range, °F.: 550-650
Yield, vol %: 10.47
Gravity, °API: 27.13
Sulfur, wt %: 1.15

Residue
Range, °F.: 650+
Yield, vol %: 68.16
Sulfur, wt %: 2.8
Ni/V, ppm: 74.77/301.08

Oriente, Ecuador

Puerto Balao/ Esmeraldas, Ecuador

Crude
Gravity, °API: 29.2
Sulfur, wt %: 1.01
Vis., cSt @ 104° F.: 13.0
Pour pt, °F.: 25.0
C_4 & lighter, vol %: 4.7
Rvp @ 100° F., psi: 3.70
Ni/V, ppm: 39/65

Light naphtha
Range, °F.: Ibp-200
Yield, vol %: 3.9
Sulfur, wt %: 0.001
Paraffins, vol %: 62.4
Naphthenes, vol %: 35.0
Aromatics, vol %: 2.6
RON clear: 67.3

Heavy naphtha
Range, °F.: 200-400
Yield, vol %: 17.3
Sulfur, wt %: 0.01
P/N/A, vol %: 44.9/45.8/9.3
RON clear: 45.9
Aniline pt, °F.: 130

Kerosine
Range, °F.: 400-500
Yield, vol %: 6.4
Gravity, °API: 40.6
Sulfur, wt %: 0.16
Vis., cSt @ 104° F.: 1.78
Smoke pt, mm: 20
Freezing pt, °F.: –41
Aniline pt, °F.: 142

Gas oil
Range, °F.: 500-620
Yield, vol %: 14.7
Gravity, °API: 35.1
Sulfur, wt %: 0.49
Vis., cSt @ 104° F.: 3.33
Pour pt, °F.: 5
Aniline pt, °F.: 153

Vacuum gas oil
Range, °F.: 620-1,000
Yield, vol %: 32.0
Gravity, °API: 25.2
Sulfur, wt %: 1.14
Vis., cSt @ 104° F.: 33.0
Pour pt, °F.: 90
Ni/V, ppm: 1/<1

Residue
Range, °F.: 620+
Yield, vol %: 51.5
Gravity, °API: 17.0
Sulfur, wt %: 1.66
Vis., cSt @ 104° F.: 649
Vis., cSt @ 212° F.: 34.1

Tia Juana Light, Venezuela

La Salina, State of Zulia

Crude
Gravity, °API: 32.1
Sulfur, wt %: 1.1
Kin. vis., SSU @ 100° F.: 60
Pour pt, °F.: –45
Yield, 0°(IVT)-82° F., vol %: 2.16

Light naphtha
Range, °F.: 82-200
Yield, vol %: 5.19

Heavy naphtha
Range, °F.: 200-300
Yield, vol %: 10.82
Sulfur, wt %: 0.0017
Paraffins, %: 65.99
Naphthenes, %: 24.30
Aromatics, %: 9.71
RON clear: 53.6

Naphtha
Range, °F.: 300-350
Yield, vol %: 4.82
Sulfur, wt %: 0.0077
P/N/A, %: 51.23/31.69/17.08

Kerosine
Range, °F.: 350-400
Yield, vol %: 4.64
Sulfur, wt %: 0.0281
P/N/A, %: 45.77/35.64/18.58
Smoke pt, mm: 23.37
Aniline pt, °F.: 134.99

Gas oil
Range, °F.: 400-500
Yield, vol %: 10.41
Gravity, °API: 40.72
Sulfur, wt %: 0.11
Smoke pt, mm: 14.99
Aniline pt, °F.: 147.31
Cetane index: 50.43

Gas oil
Range, °F.: 500-550
Yield, vol %: 4.96
Gravity, °API: 36.17
Sulfur, wt %: 0.4540
Smoke pt, mm: 11.99
Aniline pt, °F.: 158.47

Gas oil
Range, °F.: 550-650
Yield, vol %: 9.25
Gravity, °API: 32.39
Sulfur, wt %: 0.78
Smoke pt, mm: 14.42
Aniline pt, °F.: 168.05

Residue
Range, °F.: 650 +
Yield, vol %: 47.75
Gravity, °API: 16.46
Sulfur, wt %: 1.87
Ni/V, ppm: 26/224

Tia Juana Pesado (Heavy), Venezuela

Puerto Miranda, Lake Maracaibo

Crude
Gravity, °API: 12.10
Sulfur, wt %: 2.7
Kin. vis., cSt @ 122° F.: 2,983
Pour pt, °F.: 30
Yield, 0°(IVT)-82° F., vol %: 0.08

Naphtha
Range, °F.: 82-200
Yield, vol %: 0.10

Heavy naphtha
Range, °F.: 200-300
Yield, vol %: 0.53
Sulfur, wt %: 0.209

Naphtha
Range, °F.: 300-350
Yield, vol %: 0.52
Sulfur, wt %: 0.21

Kerosine
Range, °F.: 350-400
Yield, vol %: 0.90
Sulfur, wt %: 0.24
Aromatics, %: 13.31
Smoke pt, mm: 20.53
Aniline pt, °F.: 122.34

Gas oil
Range, °F.: 400-500
Yield, vol %: 4.52
Gravity, °API: 31.9
Sulfur, wt %: 0.6
Smoke pt, mm: 13.26
Aniline pt, °F.: 128.0
Cetane no.: 32.46
Cetane index: 33.27

Gas oil
Range, °F.: 500-550
Yield, vol %: 3.12
Sulfur, wt %: 0.93

Gas oil
Range, °F.: 550-650
Yield, vol %: 7.92
Gravity, °API: 22.96
Sulfur, wt %: 1.51

Residue
Range, °F.: 650 +
Yield, vol %: 82.15
Gravity, °API: 8.94
Sulfur, wt %: 3.0
V, ppm: 532

Bombay High, India

Floating storage in Arabian Sea producing area

Crude
Gravity, °API: 39.35
Rvp @ 38° C., kg/sq cm: 0.34
Pour pt, °C.: +30
Kin. vis., cSt @ 40° C.: 3.28
Sulfur, wt %: 0.17
Salt content, lb/1,000 bbl: 11
Con. carbon, wt %: 1.2
Wax (E.H.), wt %: 10.6
Yield, vol %: 20.6
Gravity, °API: 58.42
Charac. factor K UOP: 11.7
V/Ni/Fe, ppm: 0.3/1.0/<0.3

Naphtha
Range, °C.: C_5–150
Yield, wt %: 18.6
Rvp, Kg/sq cm @ 38° C.: 0.42
Sulfur, total, ppm: 3.0
Mercaptan sulfur, ppm: 1.3
Paraffins, vol %: 53.7
Napthenes, vol %: 25.0
Aromatics, vol %: 21.3
RON, clear: 69.6
RON + 0.56 g Pb/l as TEL: 82.1

Kerosine
Range, °C.: 140–240
Yield, wt %: 19.3
Yield, vol %: 19.6
Gravity, °API: 43.75
Sulfur, total, ppm: 66
Mercaptan sulfur, ppm: 1.5
Flash pt, (Abel), °C.: 46.5
Smoke pt, mm: 19
Freezing pt, °C.: − 54.0
Aniline pt, °C.: 52.2
Kin. vis., cSt @ − 30° C.: 4.18
P/N/A, vol %: 39.8/23.9/26.3

Gas oil
Range, °C.: 240–370
Yield, wt %: 25.6
Yield, vol %: 25.2
Gravity, °API: 34.25
Pour pt, °C.: + 3
Kin. vis., cSt @ 37.8° C.: 4.17
Sulfur, total, wt %: 0.14
Aniline pt, °C.: 73.2
Diesel index: 56

Vacuum gas oil
Range, °C.: 370–550
Yield, wt %: 29.3
Yield, vol %: 27.5
Gravity, °API: 29.86
Pour pt, °C.: + 51
Kin. vis., cSt @ 70° C.: 11.0
Kin. vis., cSt @ 98.9° C.: 5.65
Con. carbon, wt %: 0.17
Asphaltene, wt %: 0.06
V/Ni/Cu/Fe, ppm: <0.3/<0.3/<0.1/<0.3

Residue
Range, °C.: 370 +
Yield, wt %: 34.6
Yield, vol %: 31.0
Gravity, °API: 21.24
Pour pt, °C.: + 51
Sulfur, total, wt %: 0.38
Kin. vis., cSt @ 98.9° C.: 14.37
Kin. vis., cSt @ 70° C.: 24.66
Con. carbon, wt %: 4.33
Asphaltene, wt %: 1.22
V/Ni/Cu/Fe, ppm: 0.8/2.8/<0.1/0.35

Residue
Range, °C.: 550 +
Yield, wt %: 5.3
Yield, vol %: 3.5
Gravity, °API: 7.86
Pour pt, °C.: +78
Sulfur, total, wt %: 0.77
Kin. vis., cSt @ 98.9° C.: 1,396.58
Con. carbon, wt %: 23.70
Asphaltene, wt %: 8.40
V/Ni/Cu/Fe, ppm: 5.0/18.0/<0.1/1.9

North America

Bow River Heavy, Alberta

*Bow River Pipe Lines Ltd. to Edmonton**

Crude
Gravity, °API: 26.7
Sulfur, g/kg: 21.0
Rvp, kPa: 37.2
Pour pt, °C.: −50.0
Con. carbon, wt %: 6.70
Vis., cSt @ 40° C.: 18.30
Ni/V, wt ppm: 20.7/54.0
C_3, yield, vol %: 0.41
C_4s, yield, vol %: 1.47

Naphtha
Range, °C.: C_5-190
Yield, vol %: 20.40
Sulfur, g/kg: 0.61
Paraffins, vol %: 65.50
Olefins, vol %: 0.40
Naphthenes, vol %: 26.80
Aromatics, vol %: 7.30

Kerosine
Range, °C.: 190-277
Yield, vol %: 13.10
Sulfur, g/kg: 4.40
P/O/N/A, vol %: 73.20/2.60/0.00/24.20
Aniline pt, °C.: 57.7
Pour pt, °C.: −60.6
Cetane no.: 44.0
Cetane index: 52.3
Smoke pt, mm: 27.0

Distillate
Range, °C.: 277-343
Yield, vol %: 10.80
Gravity, °API: 29.6
Sulfur, g/kg: 10.30
Aromatics, vol %: 55.10
Aniline pt, °C.: 63.9
Pour pt, °C.: − 35.0
Cetane no.: 46.0
Cetane index: 49.6
Vis., cSt @ 38° C.: 5.57

Gas oil
Range, °C.: 343-565°
Yield, vol %: 32.50
Gravity, °API: 20.9
Sulfur, g/kg: 21.00
Total nitrogen, wt %: 0.03
Pour pt, °C.: 12.1
Con. carbon, wt %: 0.60
Vis. cSt @ 38° C.: 57.30
Ni/V, ppm: 0.00/0.12

Residue
Range, °C.: 565 +
Yield, vol %: 23.20
Gravity, °API: 5.3
Sulfur, g/kg: 38.20
Pour pt, °C.: 73.0
Vis., cSt @ 135° C.: 940
Penetration @ 25° C.: 19
Ni/V, wt ppm: 67.70/169.00

*Has access to Interprovincial and Trans Mountain pipelines at Edmonton

Cold Lake,* Alberta

Alberta Oil Sands Pipeline Ltd. to Edmonton†

Crude
Density, g/cu cm: 0.9031
Sulfur, wt %: 2.91
Vis., cSt @ 15° C.: 70.7

Neut. No.: 0.71
Nitrogen, wt %: 0.29
Pour pt, °C.: − 60
C_5 & lighter yield, vol %: 7.43

Naphtha
Range, °C.: 20-175
Yield, vol %: 30.0
RON clear: 63.7
Sulfur, wt %: 0.06

Distillate
Range, °C.: 175-295
Yield, vol %: 10.5
Density, kg/cu cm: 0.7983
Sulfur, wt %: 0.76
Aniline pt, °C.: 56
Vis., cSt @ 40° C.: 2.0
Freezing pt, °C.: − 61.5
Pour pt, °C.: − 51
Smoke pt, °C.: 18.4

Gas oil
Range, °C.: 343-517
Yield, vol %: 18.7
Density, kg/cu cm @ 15° C.: 0.9536
Sulfur, wt %: 2.96
Nitrogen, wt %: 0.08
Ni/V, wt ppm: 0.05/0.15

Residium
Range, °C.: 343+
Yield, vol %: 51.6
Density, kg/cu cm: 1.0203
Sulfur, wt %: 4.8
Vis., cSt @ 60° C.: 7,750
Pour pt, °C.: +51
Ni/V/Fe, wt ppm: 90.6/213.7/12.8

Asphalt
Range, °C.: 405+
Yield, vol %: 47.8
Density @ 15° C., kg/cu m: 1,030.7
Pen. @ 25° C. (100/5): 343
Pen. @ 4° C. (100/5): 36
Pen. index: − 1.01
Vis. @ 60° C., Poises: 298
Vis. @ 100° C., cSt: 994

Asphalt
Range, °C.: 470+
Yield, vol %: 37.7
Density @ 15° C., kg/cu m: 1,046.9
Pen. @ 25° C. (100/5): 60
Pen. @ 4° C. (100/5): 6
Pen. index: − 0.46
Vis. @ 60° C., Poises: 3,576
Vis. @ 100° C., cSt: 4,894

*Diluent added to crude to permit pipeline transportation. This assay made on blend of 28 wt % mixed condensate (gravity, °API, 58.9) and 72 wt % Cold Lake Crude that had the following characteristics:

Gravity, °API: 13.2
Density @ 15° C.: 0.9770
Sulfur, wt %: 4.11
Nitrogen, wt %: 0.42
Pour pt, °C.: − 4
Vis., cSt @ 40° C.: 1,057
Vis., cSt @ 80° C.: 98

*Has access to Interprovincial and Trans Mountain pipelines at Edmonton.

Federated Light and Medium, Alberta

*Federated Pipe Line Ltd. to Edmonton**

Crude
Gravity, °API: 39.7
Sulfur, g/kg: 2.01
Total nitrogen, wt %: 0.11
Rvp, kPa: 31.0
Pour pt, °C.: − 10.0
Con. carbon, wt %: 1.46
Vis. cSt @ 40° C.: 3.30
Wax, wt %: 9.12
Neut. value, mg: 0.00
Ni/V, ppm: 0.07/0.00
C_4 & lighter, vol %: 3.43

Naphtha
Range, °C.: C_5-190
Yield, vol %: 30.90
Sulfur, g/kg: 0.05
Paraffins, vol %: 28.30
Naphthenes, vol %: 54.90
Aromatics, vol %: 16.80
RON clear: 56.4

Kerosine
Range, °C.: 190-277
Yield, vol %: 18.25
Gravity, °API: 41.0
Sulfur, g/kg: 0.68
Aromatics, vol %: 23.00
Aniline pt, °C.: 142.0
Pour pt, °C.: − 40.0
Freezing pt, °C.: − 39.0
Cetane no.: 47.0

Distillate
Range, °C.: 277-343
Yield, vol %: 13.73
Gravity, °API: 34.6
Sulfur, g/kg: 1.97
Aniline pt, °C.: 80.7
Pour pt, °C.: − 7.5
Cetane no.: 55.0
Cetane index: 49.0
Vis., cSt @ 38° C.: 4.43

Gas oil
Range, °C.: 343-565
Yield, vol %: 28.29
Gravity, °API: 25.6
Sulfur, g/kg: 3.10
Total nitrogen, wt %: 0.16
Pour pt, °C.: 40.0
Con. carbon, wt %: 0.45
Vis., cSt @ 50° C.: 29.32
Ni/V, wt ppm: 1.24/0.00

Residue
Range, °C.: 565+
Yield, vol %: 8.83
Gravity, °API: 15.2
Sulfur, g/kg: 5.40
Pour pt, °C.: 26.0
Vis., cSt @ 135° C.: 30.64
Ni/V, wt ppm: 9.50/5.70

*Has access to Interprovincial and Trans Mountain pipelines at Edmonton.

Gulf Alberta, L & M

*Gulf Alberta Pipeline to Edmonton**

Crude
Gravity, °API: 35.1
Sulfur, g/kg: 9.80
H_2S, wt ppm: 58.1
Rvp, kPa: 36.4
Pour pt, °C.: − 27.5
Vis., cSt @ 40° C.: 4.86
Ni/V, wt ppm: 10.10/9.00
C_4 & lighter, yield, vol %: 3.50

Naphtha
Range, °C.: C_5-190
Yield, vol %: 30.60
Sulfur, g/kg: 0.36
Paraffins, vol %: 56.04
Olefins, vol %: 0.00
Naphthenes, vol %: 31.53
Aromatics, vol %: 12.43

Kerosine
Range, °C.: 190-277
Yield, vol %: 14.20
Gravity, °API: 39.9
Sulfur, g/kg: 2.76
Aromatics, vol %: 28.13
Aniline pt, °C.: 59.7
Pour pt, °C.: − 40.0
Cetane no.: 46.0
Cetane index: 49.0
Smoke pt, mm: 19.0

Distillate
Range, °C.: 277-343
Yield, vol %: 8.53
Gravity, °API: 22.1
Sulfur, g/kg: 7.67
Aniline pt, °C.: 70.0
Pour pt, °C.: − 10.0
Cetane no.: 52.0
Cetane index: 55.0
Vis., cSt @ 38° C.: 5.14

Gas oil
Range, °C.: 343-565
Yield, vol %: 31.43
Gravity, °API: 23.8
Sulfur, g/kg: 12.72
Total nitrogen, wt %: 0.13
Pour pt, °C.: 31.0
Con. carbon, wt %: 0.23
Vis., cSt @ 38° C.: 44.22
Ni/V, ppm: 0.40/0.00

Residue
Range, °C.: 565+
Yield, vol %: 15.2
Gravity, °API: 14.6
Sulfur, g/kg: 23.87
Pour pt, °C.: 44.0
Vis., cSt @ 135° C.: 59.97
Ni/V, wt ppm: 24.10/25.10

*Access to Interprovincial and Trans Mountain pipelines at Edmonton.

Lloydminster,* Alberta and Saskatchewan

Husky Oil Operations Ltd. pipeline to Hardisty, Alta.†

Crude
Gravity, °API: 20.7
Sulfur, g/kg: 31.5
Rvp, kPa: 30.3
Pour pt, °C.: − 32.0
Con. carbon, wt %: 9.18
Vis., cSt @ 40° C.: 101.00
Neut. value, mg: 0.78
Ni/V, wt ppm: 52.70/10.50
C_4 & lighter, yield, vol %: 0.48

Naphtha
Range: C_5-190°
Yield, vol %: 19.50
Sulfur, g/kg: 0.79
Paraffins, vol %: 55.10
Olefins, vol %: 1.50
Naphthenes, vol %: 31.60
Aromatics, vol %: 11.80

Kerosine
Range, °C.: 190-277
Yield, vol %: 9.80
Gravity, °API: 34.9
Sulfur, g/kg: 5.05
Aromatics, vol %: 22.40
Aniline pt, °C.: 52.4
Pour pt, °C.: − 63.3
Cetane no.: 35.0
Smoke pt, mm: 19.0

Distillate
Range, °C.: 277-343
Yield, vol %: 9.50

Gravity, °API: 26.5
Sulfur, g/kg: 8.45
Aromatics, vol %: 38.90
Aniline pt, °C.: 56.5
Pour pt, °C.: − 31.1
Cetane no.: 40.0
Cetane index: 41.5
Vis., cSt @ 38° C.: 6.32

Gas oil
Range, °C.: 343-565
Yield, vol %: 25.20
Gravity, °API: 17.5
Sulfur, g/kg: 28.50
Aniline pt, °C.: 72.2
Pour pt, °C.: 1.7
Con. carbon, wt %: 0.55
Vis., cSt @ 38° C.: 155.00
Ni/V, wt ppm: 0.00/0.10

Residue
Range, °C.: 565+
Yield, vol %: 36.00
Gravity, °API: 2.9
Sulfur, g/kg: 56.90
Pour pt, °C.: 69.0
Con. carbon, wt %: 25.10
Vis., cSt @ 135° C.: 3,260
Ni/V, wt ppm: 123/231

*Crude has been blended with pipeline condensate to permit transportation. Typically 20-25% condensate is added to crude.
†Has access to Interprovincial pipeline at Hardisty.

Rainbow Light and Medium, Alberta

*Rainbow Pipe Line Co. Ltd. to Edmonton**

Crude
Gravity, °API: 40.7
Sulfur, g/kg: 5.00
H_2S, wt ppm: 10.2
Rvp, kPa: 33.9
Pour pt, °C.: 2.5
Con. carbon, wt %: 1.65
Vis., cSt @ 40° C.: 3.77
Wax, wt %: 20.40
Neut. value, mg: 0.08
Ni/V, wt ppm: 0.85/0.50
C_4 & lighter, yield, vol %: 3.40

Naphtha
Range, °C.: C_5-190
Yield, vol %: 38.70
Sulfur, g/kg: 0.14
Paraffins, vol %: 61.25
Naphthenes, vol %: 25.96
Aromatics, vol %: 12.79
RON clear: 51.2
MON clear: 51.4

Kerosine
Range, °C.: 190-277
Yield, vol %: 13.00
Gravity, °API: 42.2
Sulfur, g/kg: 1.20
Aromatics, vol %: 24.23
Aniline pt, °C.: 62.3
Pour pt, °C.: − 37.5
Freezing pt, °C.: − 35.0
Cetane no.: 46.0
Cetane index: 47.8
Smoke pt, mm: 20.0
Vis., cSt @ 40° C.: 1.55

Distillate
Range, °C.: 277-343
Yield, vol %: 11.50
Gravity, °API: 35.0
Sulfur, g/kg: 4.40
Aniline pt, °C.: 75.5
Pour pt, °C.: − 5.0
Cetane no.: 59.0
Cetane index: 55.0
Vis., cSt @ 38° C.: 4.51

Gas oil
Range, °C.: 343-565
Yield, vol %: 31.65
Sulfur, g/kg: 8.04
Total nitrogen, wt %: 0.69
Pour pt, °C.: 26.0
Con. carbon, wt %: 0.16
Vis., cSt @ 50° C.: 20.39
Asphaltenes, vol %: 4.10
Ni/V, wt ppm: 0.02/0.00

Residue
Range, °C.: 565+
Yield, vol %: 5.15
Gravity, °API: 19.6
Sulfur, g/kg: 10.71
Total nitrogen, wt %: 3.22
Pour pt, °C.: 28.0
Con. carbon, wt %: 11.11
Vis., cSt @ 135° C.: 27.82
Asphaltenes, wt %: 13.42
Ni/V, wt ppm: 4.60/2.90

*Has access to Interprovincial and Trans Mountain pipelines at Edmonton.

Rangeland-South L & M, Alberta

Rangeland Pipe Line Co. to Canadian/U.S. border near Carway, Alta.

Crude
Gravity, °API: 39.5
Sulfur, g/kg: 7.52
H_2S, wt ppm: 20.1
Rvp, kPa: 39.3
Pour pt, °C.: − 40.0
Con. carbon, wt %: 0.69
Vis., cSt @ 40° C.: 2.67
Wax, wt %: 12.44
Neut. value, mg: 0.12
Ni/V, wt ppm: 1.20/1.40
C_4 & lighter, yield, wt %: 3.22

Naphtha
Range, °C.: C_5-190
Yield, vol %: 38.75
Sulfur, g/kg: 0.12
Rvp, kPa: 41.1
Paraffins, vol %: 42.45
Naphthenes, vol %: 36.86
Aromatics, vol %: 20.69
RON clear: 58.5
MON clear: 57.3

Kerosine
Range, °C.: 190-277
Yield, vol %: 15.50
Gravity, °API: 38.3
Sulfur, g/kg: 1.87
Aromatics, vol %: 24.0
Aniline pt, °C.: 62.0
Pour pt, °C.: − 37.5
Freezing pt, °C.: − 28.5
Cetane no.: 48.0
Smoke pt, mm: 20.0

Distillate
Range, °C.: 277-343
Yield, vol %: 8.55
Gravity, °API: 32.0
Sulfur, g/kg: 4.79
Aniline pt, °C.: 71.0
Pour pt, °C.: − 7.5
Cetane no.: 51.0
Cetane index: 52.0
Vis., cSt @ 38° C.: 5.24

Gas oil
Range, °C.: 343-565
Yield, vol %: 33.20
Gravity, °API: 26.5
Sulfur, g/kg: 11.64
Total nitrogen, wt %: 0.62
Aniline pt, °C.: 86.6
Pour pt, °C.: 24.0
Con. carbon, wt %: 0.10
Vis., cSt @ 38° C.: 42.02

Residue
Range, °C.: 565+
Yield, vol %: 4.0
Gravity, °API: 21.7
Sulfur, g/kg: 12.19
Pour pt, °C.: 27.5
Vis., cSt @ 135° C.: 18.75
Asphaltenes, wt %: 10.13
Ni/V, wt ppm: 3.0/7.4

Wainwright—Kinsella,* Alberta

Husky Oil Operations Ltd. pipeline to Hardisty, Alta.†

Crude
Gravity, °API: 23.1
Sulfur, g/kg: 15.80
Rvp, kPa: 30.3
Pour pt, °C.: − 39.0
Con. carbon, wt %: 6.70
Vis., cSt @ 40° C.: 32.50
Ni/V, ppm: 40.30/79.90

Naphtha
Range, °C: C_5-190
Yield, vol %: 19.0
Sulfur, g/kg: 0.50
Paraffins, vol %: 52.50
Naphthenes, vol %: 37.80
Aromatics, vol %: 8.90

Kerosine
Range, °C.: 190-277
Yield, vol %: 12.00
Gravity, °API: 36.3
Sulfur, g/kg: 3.44
Aromatics, vol %: 22.80
Aniline pt, °C.: 56.7
Freezing pt, °C.: − 51.6
Cetane no.: 37.0
Smoke pt, mm: 26.0

Distillate
Range, °C.: 277-343
Yield, vol %: 11.0
Gravity, °API: 28.1
Sulfur, g/kg: 10.50
Aromatics, vol %: 33.70
Aniline pt, °C.: 60.5
Pour pt, °C.: − 22.0
Cetane no.: 42.0
Cetane index: 43.9
Vis., cSt @ 38° C.: 5.69

Gas oil
Range, °C.: 343-565
Yield, vol %: 26.00
Gravity, °API: 19.1
Sulfur, g/kg: 21.80
Total nitrogen, wt %: 0.03
Pour pt, °C.: 12.8
Vis., cSt @ 38° C.: 131.0
Con. carbon, wt %: 0.55
Ni/V, wt ppm: 0.11/0.00

Residue
Range, °C.: 565+
Yield, vol %: 32.0
Gravity, °API: 3.7
Sulfur, g/kg: 52.60
Pour pt, °C.: 74.0
Vis., cSt @ 135° C.: 212.00
Asphaltenes, wt %: 19.10
Ni/V, ppm: 110/222

*Note: crude blended with condensate to permit transportation.
†Has access to Interprovincial Pipeline.

U.S.

Alaska North Slope (ANS, Sadlerochit)

Trans Alaska Pipeline to Valdez Terminal

Crude
Gravity, °API: 26.4
Sulfur, wt %: 1.06
Pour pt, °F.: 0
Rvp, psi: 3.55
Kin. vis. @ 60° F.: 42.42
H_2S, lb/1,000 bbl: 0.35
Salt, lb/1,000 bbl: 32.7
Carbon residue, wt %: 4.40
Neut. no. (D974): 1.12
Ni/V, ppm: 11/26
Nitrogen, ppm: 2,090
C_4 & lighter, yield, vol %: 1.17

Light gasoline
Range, °F.: C_5—150
Yield, vol %: 2.2
Sulfur, wt %: <0.001
RON clear: 71.5
MON clear: 69.8
RON + 0.5g TEL/gal: 78.4

Naphtha
Range, °F.: 150—380
Yield, vol %: 15.6
Sulfur, wt %: 0.013
Paraffins, vol %: 39.7
Naphthenes, vol %: 43.3
Aromatics, vol %: 17.0

Distillate
Range, °F.: 380—650
Yield, vol %: 28.6
Gravity, °API: 33.1
Sulfur, wt %: 0.414
Pour pt, °F.: − 25
Cetane No.: 45.8
Total N_2, ppm: 79
Aromatics, vol %: 33.6

Blended gas oil
Range, °F.: 650—840
Yield, vol %: 16.4
Gravity, °API: 23.8
Sulfur, wt %: 1.10
Aniline pt, °C.: 74.7
Pour pt, °F.: 70
Carbon residue, %: 0.012
Total nitrogen, ppm: 950
Basic nitrogen: 0.03

Residue
Range, °F.: 650+
Yield, vol %: 52.4
Gravity, °API: 15.0
Sulfur, wt %: 1.63
Carbon residue, %: 8.82
Total nitrogen, ppm: 3,600
Pour pt, °F.: 80
Kin. vis. @ 210° F.: 47.54
Kin. vis. @ 275° F.: 15.55

Note: This assay is of Sadlerochit crude, originally the only component of North Slope crude. Kuparuk crude is now blended at a rate of about 120,000 b/d with Sadlerochit at pumpstation No. 1. Total ANS stream is about 1.6 million b/d. See Kuparuk analysis in this section.

Kuparuk,* Alaska

Trans Alaska Pipeline to Valdez Terminal

Crude
Gravity, °API: 23.0
Sulfur, wt %: 1.76
Pour pt, °F.: − 55
Rvp, psi: 2.6
Kin. vis. @ 60° F., cSt: 79.98
H_2S, lb/1,000 bbl: <5
Carbon residue, wt %: 7.37
Ni/V, ppm: 19/57
Nitrogen, ppm: 1,980
C_5 & lighter, vol %: 2.12

Light gasoline
Range (TBP), °F.: C_5—150
Yield, vol %: 1.6
Sulfur, wt %: 0.006

Naphtha
Range, °F.: 150—380
Yield, vol %: 14.5
Sulfur, wt %: 0.018
Paraffins, vol %: 38.3
Naphthenes, vol %: 47.0
Aromatics, vol %: 14.7

Distillate
Range, °F.: 380—650
Yield, vol %: 26.9
Sulfur, wt %: 0.66
Pour pt, °F.: − 25
Cetane No.: 45.4
Vis., cSt @ 100° F.: 3.083
Aromatics, wt %: 30.0

Gas oil
Range, °F.: 650—840
Yield, vol %: 18.9
Gravity, °API: 20.5
Sulfur, wt %: 1.79
Aniline pt, °C.: 104.3
Pour pt, °F.: 50
Kin. vis. @ 100° F.: 34.20
Carbon residue, wt %: 0.01
Total nitrogen, ppm: 600
Basic nitrogen, wt %: 0.02
V/Ni, ppm: <1

Residue
Range, °F.: 650+
Yield, vol %: 56.0
Gravity, °API: 11.7
Sulfur, wt %: 2.59
Carbon residue, wt %: 12.61
Pour pt, °F.: 40
Kin. vis. @ 210° F.: 97.15

*About 120,000 b/d of Kuparuk is blended with some 1.6 million b/d of Sadlerochit crude to produce North Slope crude. Kuparuk contribution is expected to double by early 1985.

West Sak,* Alaska

Not in production

Crude
Gravity, °API: 22.4
Sulfur, wt %: 1.82
Pour pt, °F.: − 50
Rvp, psi: 2.70
Kin. vis. @ 60° F.: 95.92
Carbon residue, wt %: 7.62
Ni/V, ppm: 22/61
Neut. no. (D974): 0.68
C_4 & lighter, yield, vol %: 0.63

Light gasoline
Range, °F.: C_5—150
Yield, vol %: 1.9
Sulfur, wt %: 0.004

Naphtha
Range, °F.: 150—380
Yield, vol %: 14.4
Sulfur, wt %: 0.018
Paraffins, vol %: 36.4
Naphthenes, vol %: 48.2
Aromatics, vol %: 15.4

Distillate
Range, °F.: 380—650
Yield, vol %: 27.5
Gravity, °API: 31.6
Sulfur, wt %: 0.700
Pour pt, °F.: − 35
Cetane no.: 42.1
Aromatics, vol %: 31.4
Vis., cSt @ 100° F.: 3.34

Gas oil
Range, °F.: 650—840
Yield, vol %: 16.6
Gravity, °API: 21.1
Sulfur, wt %: 1.81
Pour pt, °F.: 60
Kin. vis. @ 100° F.: 43.99
Total nitrogen, ppm: 840
Basic nitrogen: 0.023

Residue
Range, °F.: 650+
Yield, vol %: 55.6
Gravity, °API: 10.8
Sulfur, wt %: 2.53
Carbon residue, wt %: 13.15
Pour pt, °F.: 45
Kin. vis. @ 210° F.: 135.3
Pentane insoluble, wt %: 14.97

*Crude not in production, but pilot program is underway in Kuparuk area to determine feasibility. Assay sample obtained during drill stem test.

Crude oil streams by country of origin*

Abu Dhabi, U.A.E.
Abu Al Bu Khoosh—Cie. Francaise des Petroles
Murban—Abu Dhabi National Oil Co.
Umm Shaif (Abu Dhabi Marine)—Adnoc
Zakum (Lower Zakum)—Adnoc

Algeria
Saharan Blend—Sonatrach
Zarzaitine—Sonatrach

Angola
Cabinda—Cabinda Gulf Oil Co.
Sovo Blend—Cia. de Petroles de Angola and Texaco Angola

Brunei
Champion Export—Brunei Shell
Seria Light—Brunei Shell

Cameroon
Kole Marine Blend—Elf Serepca

Canada
Bow River Heavy—Alberta Petroleum Marketing Commission
Cold Lake—Esso Petroleum Canada/APMC
Federated—APMC/Home Oil Ltd.
Gulf Alberta L & M—APMC/Gulf Canada
LLoydminster—Husky Oil Operations Ltd.
Rainbow Light & Medium—APMC/Mobil Oil Canada
Rangeland South—APMC/Dome Petroleum Ltd.
Wainwright-Kinsella—APMC/Husky Oil Operations Ltd.

China
Shengli—Petroleum Corp. of PRC
Taching (Daqing)—Petroleum Corp. of PRC

Congo (Brazzaville)
Djeno Blend (Djeno Melange)—Elf Congo

Denmark
Dan—Dansk Undergrunds Consortium (DUC)
Gorm—DUC

Divided Zone
Burgan (Wafra)—Getty and Kuwait Oil Co.
Eocene (Wafra)—Getty and Kuwait Oil Co.
Hout—Arabian Oil Co.
Khafji—AOC

Dubai, U.A.E.
Dubai (Fateh)—Dubai Petroleum Co.

Ecuador
Oriente—Texaco

Egypt
Belayim—AGIP
Gulf of Suez Mix—Amoco

Gabon
Gamba—Elf Gabon
Lucina Marine—Elf Gabon
Mandji—Elf Gabon

Ghana
Salt Pond—Agri-Petco

India
Bombay High—Oil & Natural Gas Commission

Indonesia
Ardjuna—Atlantic Richfield Indonesia Inc.
Arimbi—ARCO Indonesia
Attaka—Union Oil Co. of Indonesia
Badak—Roy M. Huffington Inc.
Bekapai—Total Indonesie
Bunyu—Pertamina
Cinta—Independent Indonesian American Petroleum Co.
Duri (Sumatran Heavy)—Caltex Pacific Indonesia
Handil—Total Indonesie
Jatibarang—Pertamina
Minas (Sumatran Light)—Caltex Pacific Indonesia
Salawati—Phillips Petroleum Co., Indonesia
Sanga Sanga—Tesoro
Sepinggan—Yakin Mixed (4:1)—Union Oil Co. of Indonesia
Udang—Conoco of Indonesia
Walio—Petromer Trend Corp.

Iran
Aboozar (Ardeshir)—National Iranian Oil Co.
Bahrgansar/Nowruz (Sirip Blend)—NIOC
Dorrood (Darius)—NIOC
Foroozan (Fereidoon)—NIOC
Iranian Heavy—NIOC
Iranian Light—NIOC
Rostam—NIOC
Salmon (Sassan)—NIOC
Sirri—NIOC
Soroosh (Cyrus), Iran—NIOC

Iraq
Basrah Heavy—Iraq National Oil Co.
Basrah Light—INOC
Basrah Medium—INOC
Kirkuk Blend—INOC

Ivory Coast
Espoir—Phillips Petroleum Co. Ivory Coast

Kuwait
Kuwait—Kuwait Oil Co.

Libya
Amna (high pour)—Libyan National Oil Corp.
Brega—LNOC
Bu Attifel—AGIP
Es Sider—Oasis
Sarir—LNOC
Sirtica—LNOC
Zueitina—Occidental

Malaysia
Bekok—Esso Malaysia
Bintulu—Shell Malaysia
Labuan Blend—Shell Malaysia
Miri Light—Shell Malaysia
Pulai—Esso Malaysia
Tapis—Esso Malaysia
Tapis Blend—Esso Malaysia
Tembungo—Esso Malaysia

Mexico
Isthmus—Pemex
Maya—Pemex

Nigeria
Bonny Light—Shell
Bonny Medium—Shell
Brass River—Phillips Oil Co. (Nigeria)
Escravos—Gulf Oil Co. (Nigeria)
Forcados Blend—Shell
Pennington—Texaco Overseas (Nigeria)
Qua Iboe (Nigerian Light)—Mobil Oil Nigeria

Norway
Ekofisk—Phillips Petroleum
Gullfaks—Statoil
Murchison—Conoco
Statfjord—Mobil

Oman
Oman Export—Petroleum Development (Oman) Ltd. and Elf Group

Qatar
Dukhan (Qatar land)—Qatar General Petroleum Corp.
Qatar Marine—QGPC

Saudi Arabia
Arabian Heavy (Safaniya)—Arabian American Oil Co.
Arabian Light—Aramco
Arabian Light (Berri)—Aramco
Arabian Medium (Khursaniyah)—Aramco
Arabian Medium (Zuluf/Marjan)—Aramco

Sharjah, U.A.E.
Mubarek—Buttes Resources Co.

Syria
Souedie—Syrian Petroleum Co.

Trinidad
Galeota Mix (Trinidad Blend)—Amoco

Tunisia
Ashtart—Elf Aquitaine
El Borma—AGIP

United Kingdom
Argyll—Hamilton Bros.
Auk—Shell/Esso
Beatrice—Britoil
Beryl—Mobil
Brae—Marathon
Brent—Shell/Esso
Brent Blend
Buchan—BP
Cormorant, North—Shell/Esso
Cormorant, South (Cormorant "A")—Shell/Esso
Dunlin—Shell/Esso
Flotta—Occidental/Texaco
Forties—BP
Fulmar—Shell/Esso
Magnus—BP
Maureen—Phillips Petroleum
Montrose—Amoco
Murchison—Conoco
Ninian Blend—Chevron/Union/BP
Statfjord—Conoco
Tartan—Texaco
Thistle—Britoil

U.S.
Alaska North Slope (ANS, Sadlerochit)—Sohio/Exxon/ARCO
Kuparuk—ARCO
West Sak—ARCO

U.S.S.R.
Soviet Export Blend—V/O Sojuznefteexport

Venezuela
BCF 24—Affiliate of Petroleos de Venezuela
Bachaquero—Affiliate of Petroleos de Venezuela
Boscan—Affiliate of Petroleos de Venezuela
Ceuta—Affiliate of Petroleos de Venezuela
Lagomedio—Affiliate of Petroleos de Venezuela
La Rosa—Affiliate of Petroleos de Venezuela
Leona—Affiliate of Petroleos de Venezuela
Merey—Affiliate of Petroleos de Venezuela
Tia Juana Light—Affiliate of Petroleos de Venezuela
Tia Juana Pesado—Affiliate of Petroleos de Venezuela

Zaire
Zaire—Zaire Gulf Oil Co.

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*Names in parentheses are former or secondary names of crudes. Companies listed are primary operators or sales contacts.

Colombia's Caño Limón crude ready for export

Richard Corbett
Refining Editor

The completion of the Caño Limón pipeline and offshore loading facilities last month put Colombia's new Caño Limón crude into the world crude oil trade. Operators of the field, Empresa Colombia de Petroleos (Ecopetrol), Occidental de Colombia Inc., and Shell de Colombia Inc., expect an initial tanker loading capability of 90,000 b/d with total capacity reaching 250,000 b/d in by July.

The crude oil will be loaded from a tanker-loading facility and a floating storage unit located offshore in the Carribean Sea at the Covenas marine terminal. The loading facility will have two CALM buoys each capable of handling 40,000 bbl/hr, and will be able to handle two shuttle tankers at once. Information regarding assays in this series, is in OGJ, Apr. 11, 1983.

Caño Limón, Colombia

Covenas terminal to two CALM in Carribean Sea

Crude
Gravity, °API: 30.8
Sulfur, wt %: 0.47
Salt, lb/1,000 bbl: 2.0
Pour pt., °F.: 60
Vis., cSt @ 100° F.: 12.54
Vis., cSt @ 120° F.: 8.19
Neut. No., mg KOH/g: 0.27
Rvp, psi: 0.7
H_2S, scf/100 gal crude: 0.02

Light naphtha
Range, °F.: IBP – 220
Gravity, °API: 72.6
Yield, vol %: 3.94
Sulfur, wt %: 0.02
Mercaptan sulfur, vol %: 0.0002
Paraffins, vol %: 76.2
Naphthenes, vol %: 23.2
Aromatics, vol %: 0.6
Rvp, psi: 8.4

Naphtha
Range, °F.: 220-300
Gravity, °API: 59.3
Yield, vol %: 6.83
Sulfur, wt %: 0.01
Paraffins, vol %: 55.9
Naphthenes, vol %: 42.5
Aromatics, vol %: 1.6

Heavy naphtha
Range, °F.: 300-360
Gravity, °API: 51.9
Yield, vol %: 5.64
Sulfur, wt %: 0.01
Paraffins, vol %: 52.7
Naphthenes, vol %: 43.9
Aromatics, vol %: 3.4

Kerosine
Range, °F.: 360-500
Gravity, °API: 42.2
Yield, vol %: 21.09
Sulfur, wt %: 0.08
Mercaptan sulfur, vol %: 0.0004
Doctor: sweet
Smoke pt., mm: 22
Aniline pt., °F.: 163
Diesel index: 68.8
Pour pt., °F.: –60
W&N factor: 11.9
Vis., cSt @ 100° F.: 1.95

Light gas oil
Range, °F.: 500-700
Gravity, °API: 33.0
Yield, vol %: 22.04
Aniline pt., °F.: 182
Diesel index: 60.1
Pour pt., °F.: 30
Carbon residue, Rams., wt %: 0.08
Sulfur, wt %: 0.33
W&N factor: 11.9
Vis. cSt @ 100° F.: 7.16
Vis. cSt @ 210° F.: 2.04
Viscosity index: 82.4
Refractive index @ 67° C.: 1.4604
Basic nitrogen, wt %: 0.0081
Bromine No.: 5.7
V/Fe/Ni, ppm: 0.05/0.05/0.05

Atmospheric residuum
Range, °F.: 700+
Gravity, °API: 15.1
Yield, vol %: 39.89
Pour pt., °F.: 100
Carbon residue, Rams. wt %: 9.91
Sulfur, wt %: 0.84
W&N factor: 11.7
Vis., cSt @ 100° F.: 3,700.0
Vis., cSt @ 210° F.: 61.03
Viscosity index: 22.5

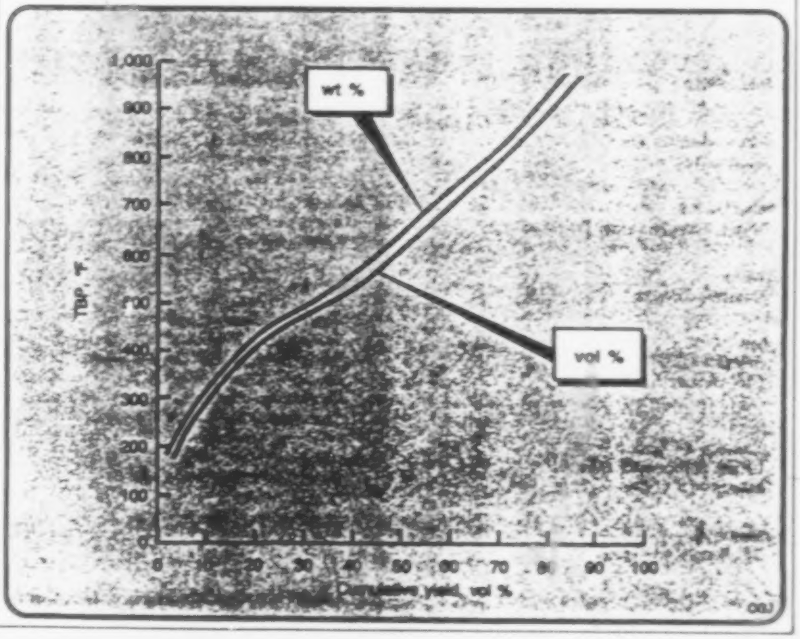
Vacuum gas oil
Range, °F.: 700-800
Gravity, °API: 26.5
Yield, vol %: 3.16
Aniline pt., °F.: 200
Diesel index: 53.0
Pour pt., °F.: 90
Carbon residue, Rams., wt %: 0.32
Sulfur, wt %: 0.52
W&N factor: 12.0
Vis., cSt @ 100° F.: 34.00
Vis., cSt @ 210° F.: 4.83
Viscosity index: 49.6
Refractive index @ 67° C.: 1.4766
Basic nitrogen, wt %: 0.0225
Bromine No.: 6.8
V/Fe/Ni, ppm: 0.05/0.20/1.40

Vacuum gas oil
Range, °F.: 800-1,000
Gravity, °API: 24.1
Yield, vol %: 15.01
Aniline pt., °F.: 210
Diesel index: 50.6
Pour pt., °F.: 105
Carbon residue, Rams, wt %: 0.44
Sulfur, wt %: 0.54
W&N factor: 12.0
Vis., cSt @ 100° F.: 65.00
Vis., cSt @ 210° F.: 6.72
Viscosity index: 43.1
Refractive index @ 67° C.: 1.4837
Basic nitrogen, wt %: 0.0289
Bromine No.: 10.0
V/Fe/Ni, ppm: 0.05/0.05/0.70

Vacuum residuum
Range, °F.: 1,000 +
Gravity, °API: 8.1
Yield, vol %: 21.74
Carbon residue, Rams., wt %: 19.26
Sulfur, wt %: 1.10
V/Fe/Ni, ppm: 41.5/12.00/95.00

Fig. 1

Cano Limon crude oil distillation



Two high-quality onshore crude oils, Sharjah

Richard A. Corbett
Refining Editor

Two northern U.A.E. condensates are actually considered high-quality crude oils. Both have respectable yields in the gas-oil range. Sharjah Condensate is produced from the Saaja gas/condensate field in Sharjah, U.A.E. Initial production, which began in mid-1982, is now 60,000 b/d.

The condensate is transported to the Hamriyah terminal through a 20-mile, 12-in. pipeline. From the terminal, the condensate travels through a 30-in. pipeline to a single point mooring (SPM) buoy in the Persion Gulf. The SPM can handle 250,000 dwt tankers.

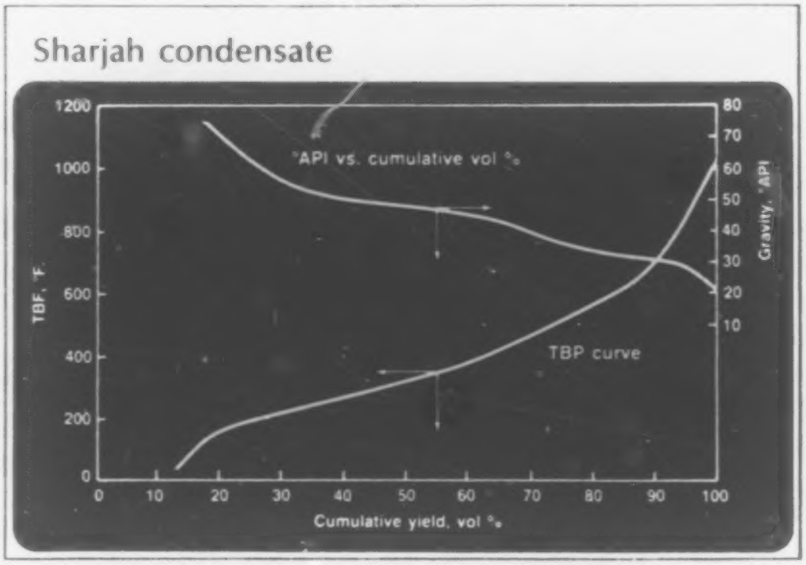
Margham Light is produced in Dubai. Production from the Margham gas/condensate field, discovered in 1982, is presently 25,000 b/d. The condensate moves by pipeline to the new Port of Jebal Ali outside Dubai which can handle very large crude tankers. Information regarding these assays, and previous assays in the series, is in OGJ, Apr. 11, 1983.

Sharjah Condensate, Sharjah, U.A.E.

Hamriyah terminal to SPM in Persian Gulf

Crude
Gravity, °API: 49.7
Sp gr, 60° F: 0.7809
Sulfur, wt %: 0.10
Rvp, psi: 10.2
Pour pt., °F: −25
Nuet no., mg KOH/g: 0.01
Rams. car., wt %: 0.1
Kin. vis., cst @ 68° F: 1.44
@ 100° F: 0.96
V/Ni/Fe, ppm: 0/0/0

Gasoline
Range, °F: C_5 - 200
Yield, vol %: 21.9
Gravity, °API: 72.8
Sulfur, wt %: 0.024
Rvp, psi: 10.7
Charac. factor 12.16
P/N/A, vol %: 78.4/14.4/7.2
RONC: 73.7
MONC: 72.3


Sharjah condensate

Naphtha
Range, °F: 200-320
Yield, vol %: 22.3
Gravity, °API: 50.9
Sulfur, wt %: 0.008
Rvp, psi: 1.2
Charac. factor: 11.51
P/N/A, vol %: 55.9/21.5/22.6
RONC: 61.6
MONC: 60.0

Heavy naphtha
Range, °F: 320-400
Yield, vol %: 11.6
Gravity, °API: 46.8
Sulfur, wt %: 0.006
Charac. factor: 11.76
Aromatics, vol %: 27.2
Aniline pt., °F: 124.9
Diesel index: 58.4
Cetane index: 36.9
Freeze pt., °F: −74
Smoke pt., mm: 22

Kerosine
Range, °F: 320-520
Yield, vol %: 25.8
Gravity, °API: 42.2
Sulfur, wt %: 0.032
Rvp, psi: 11.69
Aromatics, vol %: 33.4
Aniline pt., °F: 137.5
Diesel index: 58.0
Cetane index: 40.3
Freeze pt., °F: −53
Cloud pt., °F: −64
Pour pt., °F: −67
Smoke pt., mm: 20
Nuet. no., mg KOH/g: 0.03
Vis., SUS @ 68° F: 31.8

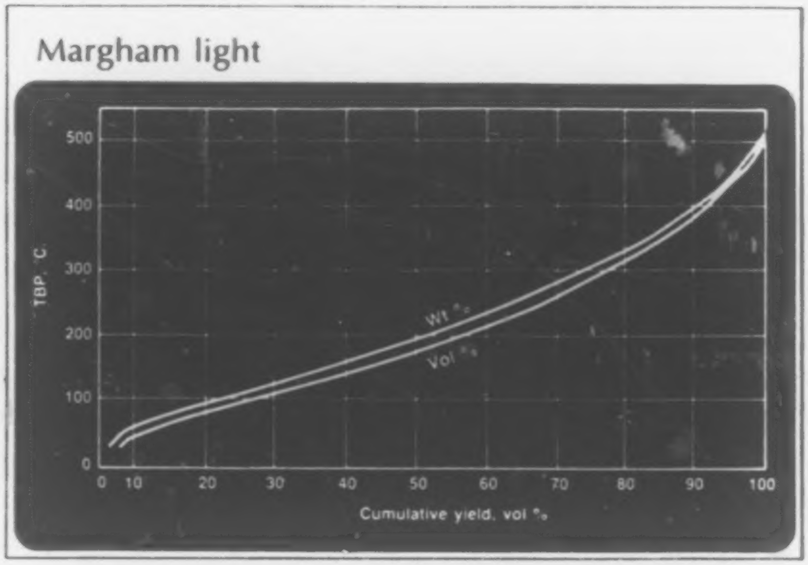
Diesel
Range, °F: 520-650
Yield, vol %: 10.9
Gravity, °API: 33.8
Sulfur, wt %: 0.266
Charac. factor: 11.75
Aniline pt., °F: 166.4
Diesel index: 56.2
Cetane index: 49.5
Cloud pt., °F: 24
Pour pt., °F: 21
Nitrogen, wt %: 0.006
Nuet. no., mg KOH/g: 0.05
Vis., SUS @ 68° F: 44.8
@ 122° F: 36.3

Gas oil
Range, °F: 650-850
Yield, vol %: 9.1
Gravity, °API: 29.7
Sulfur, wt %: 0.392
Charac. factor: 11.95
Pour pt., °F: 80
Nitrogen, wt %: 0.030
Nuet. no., mg KOH/g: 0.09
Rams. Car., wt %: 0.01
Vis., SUS @ 122° F: 58.9
@ 210° F: 38.0

Residuum
Range, °F: 650+
Yield, vol %: 13.3
Gravity, °API: 27.8
Sulfur, wt %: 0.413
Pour pt., °F: 89
Nitrogen, wt %: 0.046
Rams. car., wt %: 0.52
Vis., SUS @ 122° F: 75.2
@ 210° F: 42.8
V/Fe ppm: 1/1

Residuum
Range, °F: 850+
Yield, vol %: 4.2
Gravity, °API: 23.8
Sulfur, wt %: 0.457
Pour pt., °F: 122

Condensate and Margham Light, are assayed


Margham light

Nitrogen, wt %: 0.079
Rams. car., wt %: 1.57
Vis., SUS @ 122° F.: 281
@ 210° F.: 70.9
V/Fe, ppm: 2/2

Margham Light, Dubai, U.A.E.

Port of Jebal Ali

Crude
Gravity, °API: 50.33
Vis. cSt @ 20° C.: 1.49
Pour pt., °C.: −8
Rvp psi: 9.8
Salt, mg/l: 4
Water, wt %: 0.008
Water, vol %: < 0.01
H_2S, ppm: <5
Neut. no., mg KOH/g: <0.01
Sediment, wt %: <0.01
Sulfur, wt %: 0.04
Wax content, wt %: 4.04
Con. carbon, wt %: 0.03
Ash; wt %: <0.01
Asphaltenes, wt %: 0.05
Calorific value, BTU/lb: 20207
V/Ni/Na, ppm: <0.1/<0.1/0.4

Light naptha
Range, °C.: IBP-75
Yield, vol %: 12.88
Gravity, °API: 81.30
Sulfur, wt %: 0.02
Mercaptan sulfur, ppm: <5
Paraffins, wt %: 81.6
Naphthenes, wt %: 10.9
Aromatics, wt %: 7.5
Olefins, vol.%: 0.6

Naphtha
Range, °C.: 75-165
Yield, vol %: 29.64
Gravity, °API: 53.15
Sulfur, wt %: 0.01
Mercaptan sulfur, ppm: <5
Paraffins, wt %: 45.1
Naphthenes, wt %: 25.0
Aromatics, wt %: 29.9
Olefins, vol %: 1.0

Kerosine
Range, °C.: 165-235
Yield, vol %: 16.89
Gravity, °API: 44.52
Sulfur, wt %: 0.02
Smoke pt., mm: 22
Freeze pt °C.: −53
Aromatics, vol %: 20.4
Flash pt °C.: 61
Copper strip corrosion: 1a
Existent gum, mg/100 ml: 1
Neut. no., mg KOH/g: <0.01

Diesel
Range, °C.: 235-300
Yield, vol %: 13.34
Gravity, °API: 37.22
Sulfur, wt %: 0.02
Cetane index: 51
Pour pt. °C.: −26
Cloud pt. °C.: −23
Cold filter plug pt. °C.: −25
Kin. cSt @ 37.8° C.: 2.79
Kin. cSt @ 50° C.: 2.22
Neut. no., mg KOH/g: <0.01
Con. carbon, 10% bott., wt %: 0.04
Flash pt., °C.: 113
Copper strip corrosion: 1a
Aniline pt. °C.: 70.6
Nitrogen, wt %: <0.01

Diesel
Range, °C.: 300-350
Yield, vol %: 7.25
Gravity, °API: 36.66
Sulfur, wt %: 0.27
Cetane index: 58
Pour pt. °C.: 1
Cloud pt. °C.: 3
Cold filter plug pt. °C.: 1
Kin. cSt @ 37.8° C.: 6.00
Kin. cSt @ 50° C.: 4.40
Neut. no., mg KOH/g: <0.01
Con. carbon, 10% bott., wt %: 0.73
Flash pt., °C.: 159
Copper strip corrosion: 1a
Nitrogen, wt %: <0.01

Gas oil*
Range, °C.: 350-370
Yield, vol %: 2.63
Gravity, °API: 34.18
Sulfur, wt %: 0.25
Cloud pt., °C.: 26
*Insufficient sample for complete analysis of this fraction.

Heavy gas oil
Range, °C.: 350-514.3
Yield, vol %: 13.78
Gravity, °API: 32.04
Sulfur,wt %: 0.18
Kin. cSt @ 37.8° C.: 22.5
  @ 50° C.: 14.6
  @ 82.2° C.: 6.05
  @ 100° C.: 4.26
Pour pt., °C.: 36
Asphaltenes, wt %: <0.05
Con. carbon, wt %: <0.01
V/Ni, mg/kg: <0.1/0.2
Neut. no., mg KOH/g: 0.05
UOP K: 12.40
Nitrogen, wt %: <0.01
Aniline pt., °C.: 103.1
Wax, wt %: 17.2
Ash, wt %: <0.01
Sediment, wt %: <0.01

Residue
Range, °C.: 350+
Yield, vol %: 13.98
Gravity, °API: 31.73
Sulfur, wt %: 0.17
Kin. cSt @ 37.8° C.: 25.2
  @ 50° C.: 14.9
  @ 82.2° C.: 6.51
  @ 100° C.: 4.58
Pour pt., °C.: 32
Asphaltenes, wt %: <0.05
Con. carbon, wt %: 0.04
V/Ni, mg/kg: <0.1/0.9
Neut. no., mg KOH/g: 0.15
Nitrogen, wt %: 0.02
Aniline pt., °C.: 102.4
Wax, wt %: 20.3
Ash, wt %: 0.01
Sediment, wt %: <0.01

Australian regulatory changes open crudes to export

Richard A. Corbett
Refining/Petrochemical Editor

Since the price collapse of 1986, the Australian Government has been deregulating its domestic crude oils, which since the late 1960s, have been allocated solely to Australian refiners at set prices, and where no crude oil was exported.

This arrangement is now being dismantled, and has allowed export since 1983, with modest free-market sales since 1985.

Much of the exported crude is currently from older, established fields, but with a number of new fields that have come into production recently, some of the newer streams are beginning to find their way to many distant parts of the refining world.

There are five important Australian crude oils either now being, or likely to be, exported: Barrow Island and Gippsland crudes, which are produced from fields discovered in the 1960s; and Jabiru, Jackson blend, and Northwest Shelf condensate, all coming to production during the last 5 years.

Gippsland. Gippsland crude oil, also known as Bass Strait, is produced from the Gippsland basin, offshore Victoria in the eastern Bass Strait. The operator, Esso Exploration Australia, has a 50% interest in the basin, with the other 50% owned by BHP Petroleum Pty. Ltd. Production rates for crude and condensate from the basin were estimated at about 455,000 b/d in late 1986.

Gippsland crude is a light, sweet premium crude capable of producing very high yields of transport fuels with minimal refinery treatment (see assay) because atmospheric distillates to about 75 vol % of crude are obtainable. The intermediate, paraffinic-base crude contains moderate wax, but has a low viscosity.

The light straight run naphtha contains a high proportion of isoparaffins, making it a good gasoline base blendstock. The medium and heavy naphthas are good isomerization and reforming feeds because of high naphthenes and aromatics content. Sulfur content of the gas oils is less than 0.25 wt %, making it suitable for low-sulfur fuel oil, but better suited for catalytic cracking because of its low metals content.

Loading jetties for the crude are located at Long Island Point and Crib Point in Westernpoint Bay, about 100 km south of Melbourne in Victoria.

Each jetty can handle tankers up to 100,000 dwt, with pumping rates of 55,000 bbl/hr at Long Island, and 45,000 bbl/hr at Crib Point.

Barrow Island. The Barrow Island oil field, found in 1964, was the first oil discovery in Australia. The crude is named for the island on which it is produced, located off the northwest coast of Western Australia.

The field is operated by West Australian Petroleum Pty. Ltd. (Wapet). Wapet is a consortium of subsidiaries of Chevron Corp., Texaco Inc., and Royal Dutch Shell, each with a two-sevenths interest, and Ampol Exploration of Australia with a one-seventh interest.

Barrow Island crude is a sweet, moderately light crude with good yields of naphthas and middle distillates. Light gas oil and heavier cuts are low in sulfur and metals contents, making them suitable for low-sulfur fuel oil and catalytic cracking.

Barrow Island crude is loaded from a single buoy mooring (SBM) off Barrow Island and shipped to refining centers in Australia. Despite the fact that production has been declining from this mature field to about 15,000 b/d presently, with the changes in Australian regulations, some of the crude may still find its way to refineries around the world.

Jabiru. The Jabiru oil field, named after a rare tropical northern Australian stork, is located in the Timor Sea frontier about 300 km off the Kimberly coast of Australia's Northern Territory, and about 680 km west of Darwin. Discovered in 1983, present production is about 13,500 b/d, but that is expected to be increased in the near future.

BHP Petroleum Pty. Ltd. is the operator of the field, holding a 50% interest, with the other participants: Ampol Exploration, 6.25%; Brenda Mines, 1.1%; Esso Exploration and Production, Australia, 18.75%; Norpac Securities, 1.1%; Norcen International 12.5%; and Peko Oil, 10.3%. BHP is also developing the nearby Chalis field.

Jabiru crude is somewhat less waxy than Gippsland crude, but has similar properties. It is an intermediate/paraffinic base classed crude with low sulfur and metals contents. Substantial yields of middle distillate make it a good crude for refiners that emphasize product slates in the middle distillate range. The low sulfur and metals contents of the resid make it suitable for direct feeding to catalytic crackers.

Crude is loaded through a floating production system (FPS) that contains processing equipment to stabilize the crude oil in Jabiru field (see Fig. 1 and cover photo). The FPS is the converted 140,000-dwt tanker Jabiru Venture. Total storage capacity is about 1 million bbl (OGJ, Sept. 7, 1987, pp. 53-58).

The loading system can handle vessels in the range of 25,000-150,000 dwt, and is able to deliver parcel sizes up to 770,000 bbl at flow rates to 20,000 bbl/hr.

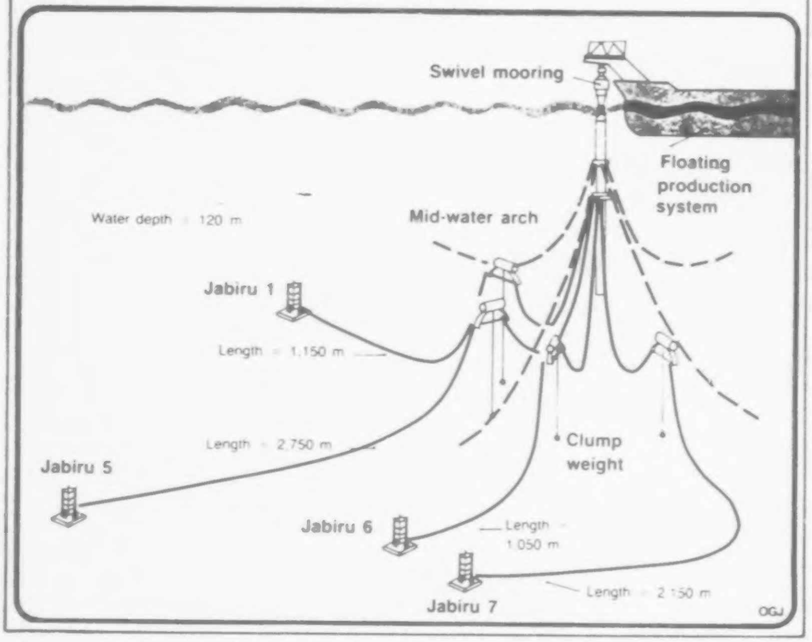
Northwest Shelf condensate. The Northwest Shelf project, encompassing three major gas fields off the Pilbara coast of Western Australia and a world scale LNG plant now under construction, produces the high-quality Northwest Shelf condensate. The project, about 1,200 km north of Perth, produced about 8,000 b/d of condensate in 1986, and was expected to double that amount in early 1987.

Woodside Petroleum is the operator in a joint venture with BP Development Australia, California Asiatic Oil Co., Shell Development Australia, and BHP Petroleum Pty. Ltd.

The high API gravity condensate provides good yields (65-66 vol %) of naphthas and about 30 vol % middle distillates. The naphthas are suitable for reforming into gasoline blendstock or aromatic petrochemical feedstocks. Total sulfur content is very low at 70 ppm.

Fig. 1

BHP's Jabiru production system



The first assay, conducted in November 1986, was completed on a sample with an Rvp of 6 psi. In January 1987, gas processing plant changes produced a condensate with an Rvp of 10 psi. Properties for the whole condensate are given for both the 6 and 10 psi Rvp streams (values in parentheses are for those properties that changed for the 10 psi Rvp stream; see assay). There were no significant differences observed in the density and other relevant properties in any fraction of the 10 psi Rvp condensate compared to the 6 psi Rvp condensate; therefore, 10 psi Rvp data are not included in the assay data for the fractions.

Northwest Shelf condensate is loaded from a dolphin berth in Withnell Bay. The berth can accomodate vessels from 19,500-130,000 dwt at loading rates to 18,000 bbl/hr.

Jackson blend. Jackson blend crude is supplied from the Cooper basin in southwestern Queensland. It is a blend of about 12 crudes from several oil fields producing in the area. Two of the participants in the field are Santos Ltd. and BHP Petroleum Pty. Ltd.

The crude is shipped via a 12-in., 495-mile pipeline completed in 1985, to Moonie in Queensland where it connects to an earlier-constructed pipeline to Brisbane. Initial flow was slated at 16,000 b/d, but the design of the line will allow up to 55,000 b/d. The line connects to the Ampol refinery at Lytton, near Brisbane.

Crude is loaded across the refinery for export. Although none of the crude is being exported at present, it is highly possible that it will in the near future.

Crude oil assays with more information on the Australian crudes follow.

Key to the assays...

Each assay is headed, in the following order, by the official name of the crude, the former or secondary name in parenthesis, and location and type loading facilities. Loading systems that frequently crop up are abbreviated. Those used are CBM (conventional buoy mooring), SPM (single point mooring), SBM (single buoy mooring), CALM (catenary anchor leg mooring), and SALM (single anchor leg mooring).

Gippsland (Bass Strait)

Jetties at Long Island Point and Crib Point

Crude

Gravity, °API: 45.4
Density @ 15° C.: 0.7993
Total sulfur, wt %: 0.10
Salt, lb/1,000 bbl: 0.5

Rvp, psi: 5.1
Total N, wt %: 0.15
Pour pt, °C.: 15
Wax, wt %: 8.9
Vis. @ 21.1° C., cSt: 2.93
Vis. @ 37.8° C., cSt: 2.03
Acid no., mg KOH/g: 0.11

Naphtha
Range, °C.: 20-190
Yield, vol %: 39.3
Gravity, °API: 61.6
Density @ 15° C., kg/l.: 0.7327
Sulfur, wt %: 0.03
P/N/A, vol %: 59.1/32.5/8.4

Kerosine
Range, °C.: 190-230
Yield, vol %: 7.1
Gravity, °API: 44.9
Density @ 15° C., kg/l.: 0.8432
Sulfur, wt %: 0.06
Aromatics, vol %: 14.7
Pour pt, °C.: −43
Smoke pt, mm: 22
Aniline pt, °C. 62.5
Cetane index: 44.7
Vis. @ 100° C., cSt: 1.44

Gas oil
Range, °C.: 230-340
Yield, vol %: 23.1
Gravity, °API: 36.2
Density @ 15° C., kg/l.: 0.8432
Sulfur, wt %: 0.08
Pour pt, °C.: −6
Cloud pt, °C.: −4
Cetane index: 51.7

Heavy gas oil
Range, °C.: 340-565
Yield, vol %: 27.4
Gravity, °API: 31.5
Density @ 15° C., kg/l.: 0.8678
Sulfur, wt %: 0.16
Wax, wt %: 35.6
Pour pt, °C.: 51
Aniline pt, °C.: 100.7
Rams. carbon, wt %: 0.3
Ni/V, ppm: 0.1/0.2
Vis. @ 100° C., cSt: 4.06

Residue
Range, °C.: 370 +, 690 +
Yield, vol %: 23.6
Gravity, °API: 30.4
Density @ 15° C., kg/l.: 0.8733
Sulfur, wt %: 0.22
Pour pt, °C.: 45
Ni/V, ppm: 0.3/0.6
Asphaltenes, wt %: 0.42

Barrow Island

SBM off Barrow Island

Crude
Gravity, °API: 36.8
Sulfur, wt %: 0.05
Kin. vis. @ 10° C., cSt: 3.40
Kin. vis. @ 100° C., cSt: 1.80
Pour pt, °C.: −30
Total acid no., mg KOH/g: 0.21

Gasoline
Range, °C.: C_5-65
Yield, vol %: 3.4
Density @ 15° C., kg/l.: 0.646
Sulfur, ppm: <50
RON clear: 78
P/N/A, vol %: 91/9/0

Light straight run
Range, °C.: 65-100
Yield, vol %: 7.7
Density @ 15° C., kg/l.: 0.728
Sulfur, ppm: <50
Ron clear: 70
P/N/A, vol %: 40/58/2

Naphtha
Range, °C.: 100-150
Yield, vol %: 14.4
Density @ 15° C., kg/l.: 0.759
Sulfur, ppm: <50
P/N/A, vol %: 46/47/7

Heavy naphtha
Range, °C.: 150-200
Yield, vol %: 15.5
Density @ 15° C., kg/l.: 0.803
Sulfur, wt %: 0.01
Aromatics, vol %: 12
Smoke pt, mm: 27
Freeze pt, °C.: < −60

Kerosine
Range, °C.: 200-250
Yield, vol %: 16.9
Density @ 15° C., kg/l.: 0.853
Kin. vis., @ 40° C., cSt: 1.67
Sulfur, wt %: 0.015
Cloud pt, °C.: −30
Aromatics, vol %: <20
Smoke pt, mm: 19
Freeze pt, °C.: < −60

Diesel
Range, °C.: 250-300
Yield, vol %: 14.6
Density @ 15° C., kg/l.: 0.886
Kin. vis. @ 48° C., cSt: 3.4
Sulfur, wt %: 0.02
Pour pt, °C.: < −30
Cloud pt, °C.: < −30
Cetane index: 36.5

Gas oil
Range, °C.: 300-350
Yield, vol %: 9.7
Density @ 15° C., kg/l.: 0.906
Kin. vis. @ 40° C., cSt: 8.11
Sulfur, wt %: 0.05
Pour pt, °C.: −30
Cloud Pt, °C.: −26
Cetane index: 41

Heavy gas oil
Range, °C.: 350-370
Yield, vol %: 2.7
Density @ 15° C., kg/l.: 0.922
Density @ 70° C., kg/l.: 0.884
Kin. vis. @ 40° C., cSt: 18.2
Sulfur, wt %: 0.09
Pour pt., °C.: −9
Cloud pt., °C.: −8

Residue
Range, °C.: 370 +
Yield, vol %: 14.5
Density @ 15° C., kg/l.: 0.953
Density @ 70° C., kg/l.: 0.917
Kin. vis. @ 60° C., cSt: 63.9
Kin. vis. @ 100° C., cSt: 15.6
Sulfur, wt %: 0.16
Wax content, wt %: 3.5
Pour pt, °C.: 12
Acid no., mg KOH/g: 0.16
Asphaltenes, wt %: 0.2
Con. carbon, wt %: 3.2
V/Ni, ppm: 1/6

Jabiru

Floating production system in offshore producing area

Crude
Gravity, °API: 42.3
Total sulfur, wt %: 0.04
Salt, ppm: 38.6
Total N, wt %: 0.05
Rvp, psi: 4.5
UOP K: 11.9
Total acid no., mg KOH/g: 0.02
Asphaltenes, wt %: <0.05
Ni/V/Na, ppm: 3/0.1/11

Light naphtha
Range, °C.: 20-70
Yield, vol %: 3.9
Gravity, °API: 84.5
Density @ 15° C., kg/l.: 0.6551
Sulfur, wt %: 0.01
P/N/A, vol %: 87.7/11.9/0.4

Heavy naphtha
Range, °C.: 70-190
Yield, vol %: 23.0
Gravity, °API: 54.8
Density @ 15° C., kg/l.: 0.7593
Sulfur, wt %: 0.01
P/N/A, vol %: 49/38.2/12.8

Kerosine
Range, °C.: 150-230
Yield, vol %: 16.8
Gravity, °API: 47.3
Density @ 1° C., kg/l.: 0.7911
Sulfur, wt %: <0.01
Aromatics, vol %: 16.3

Freeze pt, °C.: −54
Smoke pt, mm: 25
Aniline pt, °C.: 58.4
Vis. @ 40° C., cSt: 1.13

Kerosine
Range, °C.: 190-230
Yield, vol %: 9.2
Gravity, °API: 44.5
Density @ 15° C., kg/l.: 0.8036
Sulfur, wt %: <0.001
Aromatics, vol %: 14.8
Freeze pt, °C.: −43
Smoke pt, mm: 25
Aniline pt, °C.: 63.0
Vis. @ 40° C., cSt: 1.36

Gas oil
Range, °C.: 230-360
Yield, vol %: 37.9
Gravity, °API: 37.5
Density, @ 15° C., kg/l.: 0.8370
Sulfur, wt %: 0.02
Wax, wt %: 0.2
Pour pt, °C.: −3
Cloud pt, °C.: −2
Aniline pt, °C.: 75.0
Cetane index: 54.0
Vis. @ 100° C., cSt: 3.29

Heavy gas oil
Range, °C.: 360-540
Yield, vol %: 22.5
Gravity, °API: 30.8
Density @ 15° C., kg/l.: 0.8713
Sulfur, wt %: 0.10
Wax, wt %: 28.3
Pour pt., °C.: 39
Aniline pt, °C.: 97.8
Rams. carbon, wt %: 0.12
Ni/V ppm: 1.0/0.1
Asphaltenes, wt %: 0.08
Vis. @ 100° C., cSt: 4.05

Residue
Range, °C.: 360+
Yield, vol %: 24.1
Gravity, °API: 29.4
Density @ 15° C., kg/l.: 0.8791
Sulfur, wt %: 0.12
Wax, wt %: 28.1
Pour pt, °C.: 39
Rams. carbon, wt %: 0.24
Ni/V, ppm: 2.2/0.2
Asphaltenes, wt %: 0.08
Vis. @ 100° C., cSt: 4.77

Residue
Range, °C.: 540+
Yield, vol %: 1.6
Gravity, °API: 10.5
Density @ 15° C., kg/l.: 0.9962
Sulfur, wt %: 0.32
Pour pt, °C: 51
Rams. carbon, wt %: 12.5
Ni/V, ppm: 29/2.7
Asphaltenes, wt %: 1.9
Vis. @ 100° C., cSt: 239.5

Northwest Shelf condensate

Dolphin berth in Withnell Bay

Whole condensate, 6 Rvp (10 Rvp)
Gravity, °API: 53.1 (55.8)
Density, @ 15° C., kg/l.: 0.7661 (0.7551)
Total sulfur, ppm: 102
Salt, mg/l.: 12.8
Rvp, psi: 6.1 (10.5)
Total N, wt %: 0.005
Pour pt, °C.: −36
Wax, wt %: <0.1
Vis. @ 20° C., cSt: 0.99 (0.90)
Vis. @ 40° C., cSt: 0.80 (0.73)
RON clear: 54.0 (58.6)
UOP K: 11.8 (11.6)
Total acid no., mg KoH/g: 0.02
Aromatics, vol %: 10.7 (10.8)
Ni/V, ppm: 0.2/<0.1
Na/Cu/Fe, ppm: 0.5/1.0/1.1

Gasoline
Range, °C.: C_5 − 70
Yield, vol %: 17.1
Gravity, °API: 85.9
Density @ 15° C., kg/l.: 0.6508
Sulfur, wt %: 0.004
n-paraffins, vol %: 46.0
i-paraffins, vol %: 43.2
Naphthenes, vol %: 9.5
Aromatics, vol %: 1.3

Naphtha
Range, °C.: 70-190
Yield, vol %: 50.3
Gravity, °API: 53.9
Density @ 15° C., kg/l.: 0.7630
Sulfur, wt %: 0.004
n-paraffins, vol %: 21.2
i-paraffins, vol %: 20.4
Aromatics, vol %: 16.8

Kerosine
Range, °C.: 150-230
Yield, vol %: 18.2
Gravity, °API: 44.2
Density @ 15° C., kg/l.: 0.8049
Sulfur, wt %: 0.02
Aromatics, vol %: 22.3
Freeze pt, °C.: −60
Smoke pt, mm: 21
Aniline pt, °C.: 48.6
Vis. @ 40° C., cSt: 1.06

Gas oil
Range, °C: 190-230
Yield, vol %: 8.4
Gravity, °API: 42.0
Density @ 15° C., kg/l.: 0.8152
Sulfur, wt %: 0.01
Aromatics, vol %: 19.7
Freeze pt, °C.: −47
Smoke pt, mm: 21
Aniline pt, °C.: 54.8
Vis. @ 40° C., cSt: 1.06

Heavy gas oil
Range, °C.: 230-360
Yield, vol %: 18.7
Gravity, °API: 33.5
Density @ 15° C., kg/l.: 0.8570
Sulfur, wt %: 0.03
Wax, wt %: <0.1
Pour pt, °C.: −12
Cloud pt, °C.: −13
Aniline pt, °C.: 63.8
Cetane index: 45.1
Vix. @ 40° C., cSt: 3.02
Vis. @ 100° C., cSt: 1.24

Residue
Range, °C.: 360+, 680+
Yield, vol %: 2.7
Gravity, °API: 29.3
Density @ 15° C., kg/l.: 0.8794
Sulfur, wt %: 33.0
Pour pt, °C.: 30
Rams. carbon, wt %: 0.31
Ni/V, ppm: 0.6/<0.1
Asphaltenes, wt %: 0.26
Vis. @ 100° C., cSt: 3.63

Jackson blend

Loaded across Ampol refinery at Lytton

Crude
Gravity, °API: 41.9
Density @ 15° C., kg/l.: 0.8155
Sulfur, wt %: 0.03

Light straight run
Range, °C.: C_5-190
Yield, vol %: 16.5
RON clear: 25.9

Gas oil
Range, °C.: 190-230
Yield, vol %: 4.5
Aromatics, vol %: 7.0
Sulfur, wt %: 0.01

Heavy gas oil
Range, °C.: 230-320
Yield, vol %: 20.1
Sulfur, wt %: 0.02
Cloud pt, °C.: −1
Cetane index: 59.6

Residue
Range, °C.: 320+
Yield, vol %: 58.5
Con. carbon, wt %: 0.9
Ni/V, ppm: 0.4/0.1
Rams. carbn, wt %: 0.7

DEBRA A. GWYN
Director of Editorial Surveys
The Oil & Gas Journal

1989 Worldwide Petrochemical Survey

ABU DHABI

RUWAIS FERTILIZER INDUSTRIES

Ruwais. Feed: associated gas. Products: ammonia (1,000 mt/d), urea (1,500 mt/d).

ALGERIA

SONATRACH

Arzew. Feed: natural gas. Products: ammonia (1,000 mt/d), aromatics mix (1,152 mt/d), benzene (273 mt/d), ethylene (364 mt/d), formaldehyde (61 mt/d), methanol (303 mt/d), orthoxylene (115 mt/d), ld polyethylene (145 mt/d), polyvinyl chloride (106 mt/d), toluene (5,000 mt/d), urea (400 mt/d), xylene mix (748 mt/d).

ARGENTINA

ATANOR

Baradero, Buenos Aires. Feed: ethyl alcohol. Products: acetaldehyde (8,700 mt/y), acetic acid (11,050 mt/y), acetic anhydride (2,400 mt/y), acetates (12,600 mt/y).

Munro, Buenos Aires. Feed: acetates, ethyl alcohol, methanol. Products: acetaldehyde (2,405 mt/y), acetic acid (3,210 mt/y), acetone (1,400 mt/y), ethanol (11,200 mt/y), formaldehyde (25,680 mt/y).

Río Tercero, Córdoba. Feed: ethyl alcohol, natural gas. Products: acetaldehyde (3,250 mt/y), acetic acid (4,280 mt/y), methanol (12,880 mt/y).

CARBOCLOR INDUSTRIAS QUIMICAS

Campana. Feed: C_3 and C_4 refinery cuts. Products: acetone (12,000 mt/y), isopropanol (48,000 mt/y).

CASCO SAIC

Pilar. Feed: natural gas. Products: formaldehyde (38,000 mt/y), methanol (20,000 mt/y).

DIRECCION GENERAL DE FABRICACIONES MILITARES

Campana. Feed: hydrocarbon fractions. Products: aromatics mix, normal paraffins, toluene, xylene mix, solvents.

Rio Tercero, Cordoba. Feed: natural gas. Product: ammonia (12,000 mt/y).

DUPERIAL SAIC

(subsidiary of Imperial Chemical Industries)

San Lorenzo. Feed: sulfur, natural gas, naphtha, orthoxylene, propane. Products: carbon bisulfide (14,000 mt/y), ethylene (22,000 mt/y), phthalic anhydride (12,400 mt/y), ld polyethylene (22,000 mt/y).

ELECTROCLOR SAIC

Capitán Bermúdez, Santa Fe. Feed: calcium carbide, chlorine, hydrogen. Products: acetylene (15,000 mt/y), ammonia (3,000 mt/y), polyvinyl chloride (32,000 mt/y), vinyl chloride (33,500 mt/y).

IPAKO-Industrias Petroquimicas Argentinas

(owned by private Argentine interests).

Ensenada. Feed: refinery gases. Products: ethylene (15,000 mt/y), ld polyethylene (14,000 mt/y).

MALEIC SA

Ensenada, Buenos Aires. Feed: n-butane. Product: maleic anhydride (10,000 mt/y).

MONSANTO ARGENTINA SAIC

Zarate. Feed: styrene. Products: ABS (9,000 mt/y), polystyrene (40,000 mt/y).

PASA PETROQUIMICA ARGENTINA

(owned by Amcorp SA, Anglo American Corp., Argentina Holdings Ltd., Uniroyal Chemical Co. Inc., Perez Companc)

Campana. Feed: natural gas. Products: ammonia (94,000 mt/y), urea (130,000 mt/y).

Puerto Gral. San Martin, Santa Fe. Feed: butane, naphtha, propane. Products: aromatics (180,000 mt/y), butadiene (37,000 mt/y), ethylbenzene (66,000 mt/y), ethylene (24,000 mt/y), styrene (70,000 mt/y), SBR (53,000 mt/y).

PETROQUIMICA BAHÍA BLANCA SAIC

Bahia Blanca. Feed: ethane. Products: ethylene (201,000 mt/y).

PETROQUIMICA GENERAL MOSCONI

Ensenada, Buenos Aires. Feed: naphtha. Products: aromatics mix (250,000 mt/y), benzene (120,000 mt/y), cyclohexane (80,000 mt/y), orthoxylene (25,000 mt/y), paraxylene (40,000 mt/y), toluene (120,000 mt/y), xylene mix (10,000 mt/y).

POLISUR

Bahia Blanca. Feed: ethylene. Product: ld polyethylene (190,000 mt/y).

SUDAMTEX SA

Azul, Buenos Aires. Feed: dimethyl terephthalate, ethylene glycol. Products: methanol (1,650 mt/y), polyester (6,500 mt/y).

AUSTRALIA

ALTONA PETROCHEMICAL CO. LTD.

(50% Esso Australia Ltd., 50% Mobil Oil Australia).

Altona, Vic. Feed: gas oil, ethane. Products: butadiene (17,000 mt/y), carbon black oil (50,000 mt/y), ethylene (170,000 mt/y), propylene (50,000 mt/y).

AMPOL REFINERIES LTD.

Lytton, Brisbane. Feed: kerosine, naphtha, reformate. Products: toluene (2,000 mt/y), solvents (5,500 mt/y).

AUSTRALIAN SYNTHETIC RUBBER CO. LTD.

(35% Esso Australia Ltd., 35% Mobil Oil Australia Ltd., 30% Goodyear Tire & Rubber Co. Ltd).

Altona. Feed: butadiene, styrene. Products: polybutadiene (10,000 mt/y), SBR (35,000 mt/y).

BORDEN AUSTRALIA PTY. LTD.

Brisbane, Gibson Island. Feed: methanol. Product: formaldehyde (28,000 mt/y).

Melbourne. Feed: methanol. Product: formaldehyde (28,000 mt/y).

CABOT AUSTRALIA PTY. LTD.

(100% Cabct Corp.)

Altona, Vic. Feed: petroleum residual. Product: carbon black (58,000 mt/y).

CHEMPLEX AUSTRALIA LTD.

West Footscray. Feed: benzene, ethane, propylene. Products: acetone (12,200 mt/y), cumene (28,000 mt/y), ethylbenzene (130,000 mt/y), ethylene (35,000 mt/y), phenol (20,000 mt/y), unsaturated polyester (11,000 mt/y), polystyrene (27,000 mt/y), styrene (110,000 mt/y), ABS (19,000 mt/y), EPS (8,000 mt/y), SAN (10,000 mt/y), SBR latex (11,000 mt/y).

COMPOL LTD.

(50% Mobil, 50% Exxon).

Altona, Vic. Feed: ethylene. Products: polyethylene (110,000 mt/y).

CONTINENTAL CARBON AUSTRALIA PTY. LTD.

(49% affiliate of Witco Corp.—Concarb Div.)

Kurnell, NSW. Feed: creosote oil, FCC bottoms, ethylene tars. Product: carbon black (30,000 mt/y).

HOECHST AUSTRALIA LTD.

(owned 95% by Hoechst AG).

Altona. Feed: olefins. Products: hd polyethylene (75,000 mt/y), polypropylene (35,000 mt/y).

ICI AUSTRALIA LTD.

Botany, NSW. Feed: LPG, light naphtha. Products: butadiene (23,000 mt/y), butylenes (23,000 mt/y), ethylene (250,000 mt/y), ethylene oxide (36,000 mt/y), ld polyethylene (90,000 mt/y), polypropylene (55,000 mt/y), propylene (95,000 mt/y), polyvinyl chloride (55,000 mt/y), vinyl chloride (60,000 mt/y).

Laverton, Vic. Feed: vinyl chloride. Product: polyvinyl chloride (55,000 mt/y).

Rhodes. Feed: ethylene, heptene, natural gas, naphthalene, propylene. Products: acetaldehyde (15,000 mt/y), acetic acid (20,000 mt/y), butanols (9,000 mt/y), iso-octanol (14,000 mt/y), phthalic anhydride (21,500 mt/y), vinyl acetate (14,000 mt/y), solvents (9,500 mt/y), plasticizers (32,500 mt/y).

INCITEC LTD.

Gibson Island, Queensland. Feed: natural gas. Products: ammonia (237,000 mt/y), urea (245,000 mt/y).

Newcastle, NSW. Feed: natural gas. Product: ammonia (238,000 mt/y).

KWINANA NITROGEN CO. PTY. LTD.

Kwinana. Feed: natural gas, refinery offgases. Product: ammonia (80,000 mt/y).

SHELL CHEMICAL (AUSTRALIA) PTY. LTD.

Clyde, N.S.W. Feed: refinery gases. Product: polypropylene (30,000 mt/y).

Geelong, Victoria. Feed: naphtha, gasoline, refinery gases. Products: alkylbenzene-toluene-xylene mix-solvents (90,000 mt/y), polypropylene (60,000 mt/y).

AUSTRIA

CHEMIE HOLDING AG

Enns. Feed: propylene. Product: acrylonitrile (75,000 mt/y).

Linz. Feed: benzene, orthoxylene. Products: maleic anhydride (19,000 mt/y), melamine (35,000 mt/y), phthalic anhydride (37,000 mt/y), urea (400,000 mt/y), plasticizers (38,000 mt/y).

HALVIC KUNSTOFFWERKE GmbH

Hallein. Feed: vinyl chloride monomer. Product: polyvinyl chloride.

ÖMV AG

Schwechat. Feed: butane, gasoil, naphtha. Products: butadiene (50,000 mt/y), ethylene (320,000 mt/y), propylene (160,000 mt/y).

PETROCHEMIE DANUBIA GmbH
($66^{2}/_{3}\%$ OMV AG, $33^{1}/_{3}\%$ Co. Ltd. Holding AG)
Schwechat. Feed: ethylene, propylene. Products: polyethylene (310,000 mt/y), polypropylene (200,000 mt/y).

VIANOVA KUNSTHARZ AG
Werndorf. Feed: alcohols, acids, oils. Products: acrylics and alkyds, unsaturated polyesters, water soluble resins (40,000 mt/y).

BAHRAIN

GULF PETROCHEMICAL INDUSTRIES CO.
Manama. Feed: methane. Products: ammonia (330,000 mt/y), methanol (330,000 mt/y).

BANGLADESH

ZIA FERTILIZER CO. LTD.
(Bangladesh Chemical Industries Corp.)
Ashuganj. Feed: natural gas. Products: ammonia (930 mt/d), urea (1,600 mt/d).

BELGIUM

AMOCO CHEMICAL CO.
Geel. Feed: metaxylene, methanol, paraxylene, propylene. Products: isophthalic acid (39,400 mt/y), polypropylene (190,000 mt/y), terephthalic acid (132,100 mt/y).

ARCO CHEMICAL.
Rieme. Product: polyols (69,841 mt/y).

BASF ANTWERPEN NV
Antwerp. Feed: ethylene, benzene, cyclohexane. Products: caprolactam (150,000 mt/y), ethylene glycol (160,000 mt/y), ethylene oxide (150,000 mt/y), polystyrene (145,000 mt/y), polyvinyl chloride (100,000 mt/y), vinyl chloride (160,000 mt/y).

BAYER ANTWERPEN NV
Antwerp and Kallo. Feed: cyclohexane. Products: caprolactam (110,000 mt/y), nylons-6 (10,000 mt/y).

BP CHEMICALS BELGIUM
Antwerp. Products: glycols (130,000 mt/y), ethylene oxide (115,000 mt/y), ld polyethylene (130,000 mt/y), esters-ethers (75,000 mt/y).

DOW CHEMICAL
Tessenderlo. Products: polystyrene, hd polyethylene.

DSM
Limburgse Vinyl MNV
(joint venture with Entreprise Minière et Chimique)
Tessenderlo. Feed: ethylene, C12 HCl. Product: vinyl chloride (450,000 mt/y).

EXXON CHEMICAL BELGIUM
Antwerp. Feed: ethylene, hydrocarbons. Products: polyethylene (250,000 mt/y), solvents (600,000 mt/y).
Meerhout. Feed: ethylene. Product: polyethylene (265,000 mt/y).

FINAMONT SA
(50% Petrofina, 50% Montedipe)
Feluy. Feed: styrene. Products: polystyrene mass (70,000 mt/y), expandable polystyrene (30,000 mt/y).

HIMONT BELGIUM
Feluy. Feed: propylene. Product: polypropylene (260,000 mt/y).

KEMIRA SA.
Tertre. Feed: natural gas. Products: ammonia (390,000 mt/y), urea (230,000 mt/y).

MONTEFINA.
(50% Himont Inc., 50% Petrofina)
Feluy. Feed: propylene. Products: polypropylene (300,000 mt/y).

NESTE POLYPROPYLENE NV
Beringen. Feed: propylene. Product: polypropylene (240,000 mt/y).

PHILLIPS 66 CO.
Tessenderlo. Feed: olefins. Product: petrosulfur compounds (13,000 mt/y).

POLYSAR BELGIUM NV
Antwerp. Feed: isobutylene. Products: butyl rubber (85,000 mt/y).

SOLVIC SA
Jemeppe-sur-Sambre. Feed: ethylene. Products: vinyl chloride, polyvinyl chloride.

UCB-FTAL
Ostend. Feed: alcohols, cyclohexanol, orthoxylene, phenol. Products: phthalic anhydride (80,000 mt/y), phthalates (65,000 mt/y).

BRAZIL

ALBA AMAZÓNIA SA
Manaus. Feed: methanol. Product: formaldehyde (30,000 mt/y).

ALBA QUÍMICA SA
Cotia, S.P. Feed: ethanol, methanol. Products: acetaldehyde (7,200 mt/y), formaldehyde (25,200 mt/y).
Cubatão, S.P. Feed: methanol, naphtha. Products: formaldehyde (45,400 mt/y), methanol (33,600 mt/y).
Curitiba, P.R. Feed: methanol. Products: formaldehyde (45,400 mt/y).

BANN QUÍMICA SA
Ermelino Matarazzo, SP. Feed: aniline. Product: rubber chemicals (12,800 mt/y).
Paulinia, SP. Feed: benzene, naphtha. Product: aniline (6,000 mt/y).

CAPUAVA CARBONOS INDUSTRIAIS SA
Mauá, São Paulo. Feed: ethylene tar. Product: carbon black (57,000 mt/y).

CELBRAS QUIMICA E TEXTIL SA
Aratu, Bahia. Feed: dimethyl terephthalate, glycol. Product: polyester (6,000 mt/y).
Camaçari, Bahia. Feed: acrylonitrile, maleic anhydride, dimethylformamide. Product: acrylics (14,000 mt/y).
Poços de Caldas. Feed: glycol, terephthalic acid. Product: polyester (33,000 mt/y).

CIA. DE CARBONOS COLOIDAIS
Candeias, Bahía. Feed: heavy aromatic hydrocarbons. Product: carbon black (56,000 mt/y).

CIQUINE—Cia. Indústrias Químicas do Nordeste
Camaçari, Bahía. Feed: benzene, orthoxylene, phthalic anhydride, 2-ethyl hexanol, propylene. Products: maleic anhydride (6,400 mt/y), phthalic anhydride (28,000 mt/y), plasticizers (10,000 mt/y), propylene (38,800 mt/y).

COMPANHIA BRASILEIRA DE ESTIRENO
Cubatão, S.P. Feed: benzene, ethanol, ethylene. Products: ethylene (4,800 mt/y), ethylbenzene (93,000 mt/y), ethylchloride (640 mt/y), styrene (80,000 mt/y), toluene (3,200 mt/y).

COMPANHIA BRASILEIRA DE POLIURETANOS. Camacari. Product: diphenyl methane diisocyanate (12,000 mt/y).

COPAMO—CONSÓRCIO PAULISTA DE MONÓMERO SA
Santo André. Feed: ethylene. Product: vinyl chloride (130,000 mt/y).

COPENE
Camaçari, Bahia. Feed: gas oil, naphtha. Products: aromatics (200,000), benzene (222,000 mt/y), butadiene (79,000 mt/y), butylenes (46,000 mt/y), ethylene (460,000 mt/y), orthoxylene (70,000 mt/y), MTBE (68,000 mt/y), paraxylene (130,000 mt/y), propylene (272,000 mt/y), solvent (45,000 mt/y), toluene (30,000 mt/y), xylene mix (41,000 mt/y).

COPENOR
Camaçari. Feed: methanol. Product: formaldehyde (43,000 mt/y).

COPERBO
Cabo, Pernambuco. Feed: ethyl alcohol, butadiene, styrene. Products: acetaldehyde (50,000 mt/y), acetic acid (70,000 mt/y), ethylene (36,000 mt/y), polybutadiene (78,000 mt/y), SBR (18,000 mt/y), thermoplastic elastomer (4,000 mt/y), vinyl acetate (80,000 mt/y).

COPESUL
Triunfo, RGS. Feed: naphtha. Products: benzene (199,000 mt/y), butadiene (96,000 mt/y), ethylene (561,000 mt/y), propylene (300,000 mt/y), toluene (22,000 mt/y), xylene mix (72,000 mt/y).

ESTIRENO DO NORDESTE SA
Camaçari, Bahía. Feed: benzene, ethylene. Products: ethylbenzene (180,000 mt/y), polystyrene (100,000 mt/y), styrene (150,000 mt/y), toluene (800 mt/y).

FISIBA
Camaçari, Bahía. Feed: acrylonitrile. Product: acrylics (1,100 mt/y).

HIMONT DO BRASIL
Triunfo. Feed: propylene. Product: polypropylene (75,000 mt/y).

INDUSTRIAS QUÍMICAS ELETRO CLORO SA
Santo André. Feed: ethylene, vinyl chloride. Products: ethylene (10,500 mt/y), hd polyethylene (82,000 mt/y), polyvinyl chloride (156,000 mt/y), vinyl chloride (34,000 mt/y).

METANOR SA—Metanol do Nordeste
Camaçari, Bahía. Feed: carbon dioxide, natural gas. Product: methanol (70,400 mt/y).

NITRIFLEX SA
Duque de Caxias, Rio de Janeiro. Feed: acrylonitrile, butadiene, styrene. Products: ABS-MBS-SAN (21,000 mt/y), resins, rubber (21,400 mt/y).
Triunfo, RS. Feed: ENB, ethylene, propylene. Product: ethylene-propylene (10,000 mt/y).

NITROCARBONO SA
Camacari. Feed: ammonia, benzene, hydrogen. Products: caprolactam (53,000 mt/y), cyclohexane (55,000 mt/y), cyclohexanone (47,700 mt/y).

NITROFÉRTIL
Camaçari, Bahía. Feed: natural gas. Products: ammonia (1,107 mt/d), urea (1,050 mt/d).
Laranjeiras, Sergipe. Feed: natural gas. Products: ammonia (907 mt/d), urea (1,100 mt/d).

OXITENO SA INDÚSTRIA E COMÉRCIO
Camaçari, Bahia and Triunfo, RS. Feed: ethylene. Products: ethylene glycol (122,130 mt/y), ethylene oxide (122,500 mt/y).
Mauá, São Paulo. Feed: ethylene. Products: ethylene glycol (25,000 mt/y), ethylene oxide (35,000 mt/y).

PETROFLEX
Duque de Caxias. Feed: butadiene, ethylbenzene, styrene. Products: styrene (60,000 mt/y), SBR (185,000 mt/y).
Triunfo. Feed: benzene, butadiene, ethylene, styrene. Products: ethylbenzene (140,000 mt/y), SBR (40,000 mt/y).

PETROQUÍMICA TRIUNFO SA
Triunfo, Rio Grande do Sul. Feed: ethylene. Product: ld polyethylene (130,000 mt/y).

PETROQUÍMICA UNIÃO SA
Santo André, Capuava. Feed: naphtha. Products: alkybenzene (24,000 mt/y), aromatics (325,000 mt/y), benzene (170,000 mt/y), butadiene (50,000 mt/y), butylenes (59,400 mt/y), carbon black feedstock (51,000 mt/y), ethylene (360,000 mt/y), orthoxylene (35,000 mt/y), propylene (204,000 mt/y), resins (10,000 mt/y), toluene (41,000 mt/y), xylene mix (55,000 mt/y).

POLIALDEN PETROQUÍMICA SA
Camaçari, Bahia. Feed: ethylene. Product: hd polyethylene (100,000 mt/y).

POLIBRASIL
Mauá, São Paulo. Feed: propylene. Product: polypropylene (90,000 mt/y).

POLIOLEFINAS SA
Capuava, Santo André. Feed: ethylene, vinyl acetate. Product: ethylene-vinyl acetate copolymer and ld polyethylene (110,000 mt/y).
Triunfo, Rio Grande do Sul. Feed: ethylene. Product: ld polyethylene (160,000 mt/y).

POLISUL PETROQUIMICA SA
(40% Hoechst AG)
Triunfo. Feed: ethylene. Product: hd polyethylene (100,000 mt/y).

POLITENO
Camaçari, Bahia. Feed: ethylene, vinyl acetate. Product: ld polyethylene (130,000 mt/y).

PRONOR PETROQUÍMICA SA
Camaçari. Feed: methanol, natural gas, paraxylene, toluene. Products: dimethyl terephthalate (78,000 mt/y), toluene di-isocyanate (42,000 mt/y).

PROSINT PRODUTOS SINTÉTICOS SA
Rio de Janeiro. Feed: natural gas. Product: methanol (42,500 mt/y).

RHÓDIA SA
Paulínia. Feed: alcohol, cumene, paraxylene. Products: acetaldehyde (58,500 mt/y), acetic acid (73,000 mt/y), acetone (63,630 mt/y), bisphenol A (17,160 mt/y), cyclohexane (400 mt/y), isopropanol (7,700 mt/y), phenol (105,000 mt/y), terephthalic acid (110,000 mt/y-produced by Rhodiaco), vinyl acetate (29,000 mt/y).
Santo André. Feed: alcohol. Product: acetic anhydride (26,000 mt/y).

SALGEMA SA
Maceió, Alagoas. Feed: alcohol. Products: ethanol (100,000 mt/y), ethylene (100,000 mt/y).

ULTRAFÉRTIL SA
Araucária. Feed: anhydrous ammonia, asphaltic residue, syngas. Product: ammonia (396,000 mt/y), methanol (7,920 mt/y), urea (495,000 mt/y).
Cubatão. Feed: refinery off gases. Product: ammonia (30,000 mt/y).
Piaçaguera. Feed: naphtha, refinery off gases. Product: ammonia (149,820 mt/y).

UNION CARBIDE DO BRASIL LTDA.
Cubatão, São Paulo. Feed: ethylene. Products: ethanol (92,000 mt/y), ethylene (40,000 mt/y), ld polyethylene (128,000 mt/y).

USIMINAS SA
(Usinas Siderúrgicas de Minas Gerais)
Ipatinga. Feed: coke oven gas, coal tar. Products: ammonia (12.3 mt/d), benzene (33.3 mt/d), naphthalene (19 mt/d), toluene (5.3 mt/d), xylene mix (0.7 mt/d).

CANADA

ALBERTA GAS ETHYLENE CO. LTD.
Joffre, Alberta. Feed: ethane. Products: ethylene (1,457,000 mt/y), propylene (45,000 mt/y).

BASF CANADA INC.
Cornwall, Ontario. Feed: orthoxylene. Products: phthalic anhydride (40 mt/y), plasticizers (35 mt/y).

BORDEN CHEMICAL CANADA
Laval, Quebec. Feed: methanol. Product: formaldehyde (25,000 mt/y).
Edmonton, Alberta. Feed: methanol. Product: formaldehyde (35,000 mt/y).

BORG-WARNER (CANADA) LTD.
Coburg, Ont. Product: ABS (20,000 mt/y).

CABOT CANADA LTD.
Sarnia, Ont. Feed: heavy fuel oil. Product: carbon black (80,000 mt/y).

CANADIAN FERTILIZERS LTD.
Medicine Hat, Alta. Feed: natural gas. Product: ammonia (816,500 mt/y), urea (544,000 mt/y).

CANCARB LTD.
Medicine Hat, Alta. Feed: natural gas. Product: carbon black (30,000 mt/y).

CELANESE CANADA LTD.
Clover Bar (near Edmonton). Feed: butanes, ethylene, natural gas. Products: acetaldehyde (1,700 mt/y), acetic acid (72,000 mt/y), acetic anhydride (27,000 mt/y), acetone (1,200 mt/y), formaldehyde (38,000 mt/y), methanol (765,000 mt/y), vinyl acetate (52,000 mt/y).

C-I-L INC.
Courtright, Ont. Feed: natural gas. Product: ammonia (720,000 mt/y), urea (140,000 mt/y).
Edmonton, Alta. Feed: ethylene. Product: ld polyethylene, ethylene vinyl acetate (75,000 mt/y).

COLUMBIAN CHEMICALS CO.
Hamilton, Ont. Feed: heavy aromatic hydrocarbons. Product: furnace carbon black (70,000 mt/y).

COMINCO LTD.
Carseland, Alta. Feed: natural gas. Product: urea (575,000 mt/y).
Joffre, Alta. Feed: nitrogen, hydrogen. Product: ammonia (350,000 mt/y).

COMMERCIAL ALCOHOLS LTD.
Varennes, Que. Feed: ethylene. Product: ethanol (55,000 mt/y).

CYANAMID CANADA INC.
Niagara Falls, Ont. Feed: natural gas. Products: ammonia (210,000 mt/y).

DOW CHEMICAL OF CANADA INC.
Fort Saskatchewan, Alta. Feed: ammonia, caustic, chlorine, ethylene, hydrogen, natural gas, oxygen. Products: ethanolamines, ethylene dichloride, ethylene glycol, ethylene oxide, lld polyethylene, vinyl chloride.
Sarnia, Ont. Feed: benzene, butadiene, caustic, chlorine, ethylene, hydrogen, natural gas, propylene. Products: ethylbenzene, ld and hd polyethylene, polystyrene, propylene glycol, propylene oxide, styrene, vinyl chloride, SB latex.
Varennes, Que. Feed: butadiene, styrene. Product: SB latex.

DU PONT CANADA INC.
Corunna, Ont. Feed: ethylene. Product: ld & hd polyethylene (235,000 mt/y).

ESSO CHEMICAL CANADA
(Division of Imperial Oil)
Ioco, B.C. Feed: naphtha. Product: xylene (7,000 mt/y).
Redwater, Alberta. Feed: natural gas. Products: ammonia (825,000 mt/y), urea (525,000 mt/y).
Sarnia, Ontario. Feed: natural gas liquids, refinery off gases. Products: benzene (100,000 mt/y), butadiene (8,000 mt/y), butylenes (40,000 mt/y), carbon black (65,005 mt/y), ethylene (220,000 mt/y), polyethylene (135,000 mt/y), polyvinyl chloride (90,000 mt/y), propylene (40,000 mt/y), toluene (70,000 mt/y), xylene (30,000 mt/y).

ETHYL CANADA INC.
Corunna, Ont. Feed: ethylene, anhydrous hydrogen chloride. Product: ethylchloride (30,000 mt/y).

B.F.GOODRICH CANADA INC.
Fort Saskatchewan, Alta. Product: polyvinyl chloride (100,000 mt/y).
Niagara Falls, Ont. Product: polyvinyl chloride resins (95,000 mt/y).
Scotford, Alta. Product: polyvinyl chloride resins.
Shawinigan, Quebec. Product: polyvinyl chloride resins (57,000 mt/y).

HIMONT CANADA INC.
Varennes, Quebec. Feed: propylene. Product: polypropylene (135,000 mt/y).

NITROCHEM INC.
Maitland, Ontario. Feed: natural gas. Products: ammonia (80,000 mt/y).

NOVACOR CHEMICALS LTD.
Joffre, Alberta. Feed: ethylene. Product: lld polyethylene (385,000 mt/y).
Medicine Hat, Alberta. Feed: natural gas. Product: methanol (2,800 mt/d).
Sarnia, Ont. Feed: ethylene. Products: ld-hd polyethylene (200,000 mt/y).

OCELOT AMMONIA CO.
Kitimat, B.C. Feed: natural gas. Products: ammonia (550 mt/d), methanol (1,200 mt/d).

PETRO-CANADA PRODUCTS
Montreal. Feed: crude oil. Products: benzene (115,000 mt/y), toluene (110,000 mt/y), xylene mix (115,000 mt/y).

POLYSAR LTD.
Cambridge, Ont. Feed: styrene. Product: polystyrene (37,000 mt/y).
Corunna, Ont. Feed: heavy atm. gas oil, vac gas oil, naphtha from crude and condensate, NGLS. Products: aromatics mix (125,000 mt/y), benzene (140,000 mt/y), butadiene (90,000 mt/y), butylenes (130,000 mt/y), ethylene (455,000 mt/y), propylene (330,000 mt/y).
Montreal. Feed: styrene. Product: polystyrene (38,000 mt/y).
Sarnia, Ont. Feed: acrylonitrile, benzene, C_4 streams, ethylene, ethylbenzene, light oil. Products: styrene (270,000 mt/y), SBR-NBR-BR-IIR (262,000 mt/y), toluene (13,000 mt/y).

RECOCHEM INC.
Montreal, Que. Products: benzene, naphthalene, toluene, xylene.

REICHHOLD LTD.
North Bay, Ont. Feed: methanol. Product: formaldehyde (100,000 mt/y).
Port Moody, B.C. Feed: methanol. Product: formaldehyde (15,500 mt/y).
Ste. Therese, Que. Feed: methanol. Product: formaldehyde (55,000 mt/y).
Thunder Bay, Ont. Feed: methanol. Products: formaldehyde (55,000 mt/y).

SHELL CANADA LTD.
Corunna, Ont. Feed: reformate, propylene. Products: benzene (65,000 mt/y), polypropylene (140,000 mt/y), toluene (60,000 mt/y), xylene mix (60,000 mt/y).
Montreal East, Que. Feed: isopropyl alcohol. Product: acetone, C_6, oxysolvents (27,000 mt/y).
Scotford, Alta. Feed: benzene, ethylene. Product: styrene (308,000 mt/y).

SHERRITT GORDON MINES LTD.
Fort Saskatchewan, Alta. Feed: natural gas. Products: ammonia (490,000 mt/y), urea (393,000 mt/y).

SIMPLOT CHEMICAL CO. LTD.
Brandon, Man. Feed: natural gas. Products: ammonia (600 mt/d), urea (500 mt/d).

SUNCHEM INC.
Sarnia. Feed: reformate. Products: benzene (50,000 mt/y), orthoxylene (35,000 mt/y), toluene (195,000 mt/y), xylene mix (140,000 mt/y).

UNION CARBIDE CANADA LTD.
Montreal East, Que. Feed: ethylene. Products: ethylene glycol (82,000 mt/y), ethylene oxide (80,000 m/ty).
Red Deer, Alta. Product: ethylene glycol (250 mt/d).

CHILE

CAPE HORN METHANOL INC.
Punta Arenas. Feed: natural gas. Product: methanol (750,000 mt/y).

PETROX SA
Talcahuano. Feed: naphtha. Product: ethylene (60,000 mt/y).

CHINA

CHINA PETRO-CHEMICAL INTERNATIONAL
Lanzhou, Genzu Province. Feed: naphtha, gas oils. Product: ethylene (80,000 mt/y).

CHINA, TAIWAN

ARCO CHEMICAL
Kaohsiung. Products: polyols (22,222 mt/y), propylene glycols (6,802 mt/y), propylene oxide (15,419 mt/y).

CHANG CHUN PETROCHEMICAL CO. LTD.
Miaoli. Feed: acetic acid, n-isobutanol, vinyl acetate. Products: acetic acid (40,000 mt/y), acrylics (4,000 mt/y), formaldehyde (25,000 mt/y), n-isobutyl acetate (24,000 mt/y), polyvinyl alcohol (40,000 mt/y), polyvinyl butyral (1,000 mt/y).

CHANG CHUN PLASTICS CO. LTD.
Kaohsiung. Feed: acrylonitrile, methanol, phenol, urea. Products: acrylamide (6,600 mt/y), formaldehyde (33,000 mt/y), polyacrylamide (18,000 mt/y), polyester (2,400 mt/y).
Shin-Chu. Feed: acetone, bisphenol, methanol, phenol. Products: formaldehyde (50,000 mt/y), paraformaldehyde (9,000 mt/y), resin (12,000 mt/y).

CHINA AMERICAN PETROCHEMICAL CO. LTD.
Lin Yuan. Feed: paraxylene. Product: terephthalic acid (500,000 mt/y).

CHINA PETROCHEMICAL DEVELOPMENT CORP.
Kaohsiung. Feed: cyclohexane, oleum. Products: caprolactam (50,000 mt/y).
Ta-She. Feed: ammonia, propylene, syngas. Product: acetic acid (60,000 mt/y), acrylonitrile (132,000 mt/y), methanol (66,000 mt/y).
Toufen. Feed: benzene, oleum. Product: caprolactam (50,000 mt/y), ethylene, (54,000 mt/y).

CHINA SYNTHETIC RUBBER CORP.
(Licensee of Witco Corp.—Concarb Div.)
Kaohsiung. Feed: indigenous E.B. Product: carbon black (45,000 mt/y).

CHINESE PETROLEUM CORP.
Kaohsiung. Feed: crude. Products: benzene (318,500 mt/y), butadiene (128,000 mt/y), ethylene (899,000 mt/y), orthoxylene (60,000 mt/y), paraxylene (200,000 mt/y), propylene (475,600 mt/y), toluene (19,500 mt/y).

CHIUNGLONG PETROCHEMICAL CO. LTD.
Kaohsiung. Products: polypropylene glycol (22,000 mt/y), propylene glycol (5,560 mt/y), propylene oxide (15,000 mt/y).

DAIREN CHEMICAL CORP.
Kaohsiung. Feed: acetic acid, ethylene. Product: ethyl acetate (30,000 mt/y), ethylene vinyl acetate emulsion (23,000 mt/y), vinyl acetate (100,000 mt/y).

FORMOSA PLASTICS CORP.
Jen-Wu and Lin-Yuan. Products: acrylics (100,000 mt/y), acrylic acid-esters (28,500 mt/y), hd polyethylene (120,000 mt/y), polyvinyl chloride (594,000 mt/y), vinyl chloride (720,000 mt/y).

FORMOSAN UNION CHEMICAL CORP.
Lin Yuan. Feed: benzene, n-olefin, propylene tetramer. Product: alkylbenzene (90,000 mt/y).

GRAND PACIFIC PETROCHEMICAL CORP.
Ta-She, Kaohsiung. Feed: benzene, ethylene. Products: ABS (34,000 mt/y), styrene (200,000 mt/y).

HO TUNG CHEMICAL CORP.
Jen-Wu, Kaohsiung. Feed: kerosine. Product: normal paraffins (40,000 mt/y).

LEE CHANG YUNG CHEMICAL INDUSTRY CORP.
Hsin-Chu. Products: dimethyl formamide (10,000 mt/y), dimethyl ether (3,500 mt/y), dimethyl sulfate (3,000 mt/y), formaldehyde (30,000 mt/y), hexamine (5,000 mt/y), methanol (60,000 mt/y), methyl amines (10,000 mt/y), paraformaldehyde (5,000 mt/y).
Kaohsiung. Products: formaldehyde (82,500 mt/y), formic acid (4,000 mt/y), melamine-formaldehyde resin (3,000 mt/y), pentaerythritol (8,000 mt/y), phenol-formaldehyde resin (5,000 mt/y), urea-formaldehyde resin (50,000 mt/y).
Lin-Yuan. Products: acetaldehyde (40,000 mt/y), acetone (20,000 mt/y), choline chloride (5,000 mt/y), diacetone alcohol (10,000 mt/y), ethyl acetate (40,000 mt/y), ethylene glycol ethers (10,000 mt/y).

ORIENTAL UNION CHEMICAL CORP.
Kaoshiung. Feed: ethylene. Products: ethylene glycol (150,000 mt/y), ethylene oxide (117,000 mt/y).

TAIWAN FERTILIZER CO. LTD.
Miaoli. Feed: natural gas. Products: ammonia (300,000 mt/y), urea (300,000 mt/d).

TAIWAN POLYPROPYLENE CO. LTD.
Kaohsiung. Feed: propylene. Product: polypropylene (120,000 mt/y).

TAIWAN SYNTHETIC RUBBER CORP.
Ta-She, Kaohsiung. Feed: butadiene, styrene. Products: polybutadiene (40,000 mt/y), thermoplastic elastomer (20,000 mt/y), SBR (100,000 mt/y).

USI FAR EAST CORP.
Kaohsiung. Feed: ethylene. Product: hd polyethylene (80,000 mt/y), ld polyethylene (140,000 mt/y), lld polyethylene (120,000 mt/y).

COLOMBIA

AMONIACO DEL CARIBE SA
Cartagena. Feed: natural gas. Product: ammonia (350 mt/d).

CABOT COLOMBIANA SA
(subsidiary of Cabot Corp., Waltham, Mass.)
Mamonal, Cartagena. Feed: aromatic tar, natural gas. Product: carbon black (20,000 mt/y).

CARBOQUIMICA SA.
Bogota. Feed:- orthoxylene, oxoalcohols, coal tar. Products: benzene (2,000 mt/y), naphthalene (1,000 mt/y), phthalic anhydride (12,000 mt/y), plasticizers (20,000 mt/y), solvents (3,000 mt/y), toluene (2,000 mt/y), xylene mix (2,500 mt/y).

DOW COLOMBIANA SA
Cartagena. Feed: styrene. Product: polystyrene (31,000 mt/y).

EMPRESA COLOMBIANA DE PETROLEOS
Barrancabermeja. Feed: crude oil, natural gas, refinery products.Products: alkylbenzene (15,000 mt/y), benzene (43,000 mt/y), cyclohexane (20,000 mt/y), ethylene (115,000 mt/y), orthoxylene (9,000 mt/y), propylene (5,500 mt/y), solvents (50,000 mt/y), toluene (20,000 mt/y), xylene mix (36,000 mt/y).

MONOMEROS COLOMBO VENEZOLANOS SA
(affiliate of DSM)
Barranquilla. Product: caprolactam (22,000 mt/y).

PETROQUIMICA COLOMBIANA SA
Mamonal, Cartagena. Feed: vinyl chloride. Products: polyvinyl chloride (102,000 mt/y).

POLICOLSA (owned by Ecopetrol)
Barrancabermeja. Feed: ethylene. Product: ld polyethylene (55,000 mt/y).

PRODUCTOS PETROQUIMICOS
Yumbo, Valle. Feed: aromatic tar. Product: carbon black (18,000 mt/y).

ECUADOR

CIA. QUIMICA BORDEN EQUATORIANA SA
Quito. Feed: methanol. Products: formaldehyde (9,200 mt/y).

EGYPT

AMERIA PETROLEUM REFINING CO.
Ameria. Feed: naphtha. Products: alkylbenzene (40,000 mt/y), benzene (23,000 mt/y), toluene (4,000 mt/y).

EGYPTIAN PETROCHEMICAL CO.
Ameria. Feed: imported ethylene, sodium chloride. Products: polyvinyl chloride (80,000 mt/y), vinyl chloride (100,000 mt/y).

EL NASR d'ENGRAIS et d'INDUSTRIES CHIMIQUES.
Suez-Attaka. Feed: natural gas. Product: ammonia (250 t/d).
Talkha. Feed: natural gas. Product: ammonia (396 t/d), urea (570,000 mt/y).

FINLAND

KEMIRA OY
Oulu. Feed: peat. Products: ammonia (80,000 mt/y), formic acid (35,000 mt/y), urea (90,000 mt/y).

NESTE OY
Kokemaki. Feed: styrene. Product: polystyrene (10,000 mt/y).
Porvoo. Feed: alcohols, benzene, cumene, ethylene, FCC gas, glycols, LPG, naphtha, orthoxylene, refinery gases, styrene, vinyl chloride monomer. Products: acetone (50,000 mt/y), benzene (110,000 mt/y), butadiene (20,000 mt/y), cumene (140,000 mt/y), ethylene (230,000 mt/y), phthalic anhydride (20,000 mt/y), plasticizers (11,000 mt/y), polyester (15,000 mt/y), ld polyethylene (180,000 mt/y), polystyrene (35,000 mt/y), polypropylene (120,000 mt/y), polyvinyl chloride (80,000 mt/y), propylene (170,000 mt/y).

FRANCE

AMMONIAC DE GRAND QUEVILLY
(77.5% CdF Chimie AZF, 22.5% Cofaz)
Grand Quevilly (near Rouen). Feed: natural gas. Product: ammonia (1,000 mt/d).

AMMONIAC SARRO-LORRAIN
(52% CdF Chimie AZF, 27% CSL, 15% Norsolor)
Carling. Feed: natural gas. Product: ammonia (330,000 mt/y).

APPRYL
(51% Atochem, 49% BP Chimie)
Gonfreville. Product: polypropylene (120,000 mt/y).
Lavera. Product: polypropylene (250,000 mt/y).

ARCO CHEMICAL
Fos-sur-Mer. Products: MTBE (10,800 b/d), propylene glycols (49,886 mt/y), propylene oxide (149,659 mt/y), tertiary butyl alcohol (358,276 mt/y).

ATOCHEM
Balan (Ain). Products: ld polyethylene (90,000 mt/y), lld polyethylene (35,000 mt/y), polyvinyl chloride (165,000 mt/y).
Brignoud. Product: polyvinyl chloride (115,000 mt/y).
Chauny. Feed: naphthalene, orthoxylene. Product: phthalic anhydride (75,000 mt/y), plasticizers (70,000 mt/y).
Feyzin. Feed: LPG, naphtha. Products: benzene (110,000 mt/y), butadiene (30,000 mt/y), ethylene (120,000 mt/y), propylene (110,000 mt/y), toluene (40,000 mt/y).

Gonfreville l'Orcher. Feed: LPG, naphtha. Products: benzene (150,000 mt/y), butadiene (60,000 mt/y), ethylbenzene (400,000 mt/y), ethylene (390,000 mt/y), hd polyethylene (80,000 mt/y), ld polyethylene (160,000 mt/y), polystyrene (150,000 mt/y), propylene (200,000 mt/y), styrene (350,000 mt/y).

La Chambre (Savoie). Feed: acetone, ethanol, 2-butanol, isopropanol. Product: solvents (85,000 mt/y).

Lacq (Snea plant). Feed: ethane. Products: benzene (60,000 mt/y), ethylbenzene (55,000 mt/y), ethylene (75,000 mt/y), styrene (50,000 mt/y).

Lavera. Feed: LPG, naphtha. Products: aromatics (50,000 mt/y), benzene (85,000 mt/y), butadiene (50,000 mt/y), chloromethanes (120,000 mt/y), ethylene (260,000 mt/y), propylene (185,000 mt/y), vinyl chloride (400,000 mt/y).

Mont (near Lacq). Feed: ammonia, ethylene, vinyl acetate. Product: ld polyethylene with EVA copolymers (75,000 mt/y).

Notre Dame de Gravenchon (Seine Maritime). Feed: n-butenes. Product: 2-butanol (50,000 mt/y).

Port de Bouc, Fos. Product: vinyl chloride (200,000 mt/y).

Saint Auban. Products: polyvinyl chloride (130,000 mt/y), vinyl chloride (120,000), solvents (160,000 mt/y).

Saint Fons, Rhone. Product: polyvinyl chloride (175,000 mt/y).

AZOLACQ
(50% Cofaz, 50% CdF Chimie AZF)

Oissel. Feed: ammonia, carbon dioxide. Product: urea (360 mt/d).

BAYER ELASTOMÈRES

Lillebonne. Feed: butadiene, styrene. Products: polybutadiene (55,000 mt/y), SBR (8,000 mt/y), SBR latex (24,000 mt/y).

BORG WARNER

Villers Saint Sepulcre (Oise). Product: ABS (50,000 mt/y).

BP CHEMICALS LTD.

Wingles. Products: polystyrene (110,000 mt/y), expandable polystyrene (45,000 mt/y).

BP CHIMIE

Lavéra, Martigues. Feed: GPL, naphtha. Products: benzene (85,000 mt/y), butadiene (50,000 mt/y), ethylene (250,000 mt/y), ethylene glycol (165,000 mt/y), ethylene oxide (150,000 mt/y), polyisobutylene (36,000 mt/y), polyethylene (140,000 mt/y), propylene (180,000 mt/y).

CDF CHIMIE AZF
(100% CdF Chimie)

Mazingarbe. Feed: coke oven gas, naphtha. Products: ammonia (220,000 mt/y).

Toulouse. Feed: natural gas. Products: ammonia (330,000 mt/y), urea (150,000 mt/y).

CdF CHIMIE EP

Carling and Lillebonne. Feed: benzols, gazole, naphtha. Products: benzene (330,000 mt/y), butadiene (130,000 mt/y), cyclohexane (65,000 mt/y), ethylbenzene (280,000 mt/y), ethylene (420,000 mt/y), ld polyethylene (210,000 mt/y), propylene (220,000 mt/y), styrene (220,000 mt/y).

CDF CHIMIE RÉSINES
(100% CdF Chimie)

Drocourt. Feed: benzene, butadiene, styrene. Products: maleic-phthalic anhydride (20,000 mt/y), polyester (50,000 mt/y).

Saint Avold. Feed: aromatics. Product: hydrocarbon resins (24,000 mt/y).

Villers Saint Paul (Oise). Feed: benzene. Products: maleic anhydride (12,000 mt/y).

CIE. CHIMIQUE DE LA MEDITERRANEE SA
(Shell 50%, BASF 50%)

Berre l'Etang. Feed: ethylene. Product: ld polyethylene (110,000 mt/y).

CRD-TOTAL FRANCE

Gonfreville l'Orcher. Feed: crude. Products: benzene (70,000 mt/y), polybutene (20,000 mt/y), polypropylene (40,000 mt/y),toluene (20,000 mt/y).

CIE. DU POLYISOPRENE SYNTHETIQUE

Oudalle. Feed: C-5's, isoprene. Products: isoprene-azeotrope (45,000 mt/y), polyisoprene (45,000 mt/y).

COPENOR-Compagnie Petrochimique du Nord
(60% CdF Chimie EP)

Dunkirk. Feed: naphtha, gazole, LPG. Products: butadiene (75,000 mt/y), ethylene (250-275,000 mt/y), ld polyethylene (275,000 mt/y), lld polyethylene (100,000 mt/y), propylene (120,000 mt/y).

DEGUSSA

Ambès. Feed: aromatic hydrocarbons, coal tar oil. Product: carbon black.

HGD—Huiles, Goudrons et Dérivés
(94% CdF Chimie)

Mariénau. Feed: coal tars. Product: naphthalene (20,000 mt/y).

Vendin le Vieil. Feed: coal tars. Product: naphthalene (25,000 mt/y).

ICI LTD.

Balycourt. Product: plasticizers (75,000 mt/y).

NOROXO
(100% CdF Chimie)

Harnes (Pas-de-Calais). Feed: olefins. Products: oxoalcohols (115,000 mt/y), oxoacids (20,000 mt/y).

NORSK HYDRO AZOTE

Le Havre, Pardies, Rouen, Pierrefitte. Feed: gas. Products: ammonia (730,000 mt/y), urea (190,000 mt/y).

NORSOLOR
(100% CdF Chimie)

Saint Avold. Feed: acetone, alcohols, ammonia, propylene. Products: acrylic acid (100,000 mt/y), acrylonitrile (90,000 mt/y), acrylic-esters (200,000 mt/y).

ORGANICHIM.
(100% CdF Chimie)

Toulouse. Product: formaldehyde (25,000 mt/y).

Villers St. Paul. Product: formaldehyde (50,000 mt/y).

OXOCHIMIE.
(50% Atochem, 50% BP Chimie)

Lavera. Product: oxoalcohols (175,000 mt/y).

PEC-RHIN
(50% CdF Chimie AZF, 50% BASF).

Ottmarsheim. Feed: natural gas. Product: ammonia (180,000 mt/y).

PETROSYNTHESE SA
(100% Chevron Chemical Co.)

Gonfreville. Feed: benzene, propylene. Products: alkylbenzene (100,000 mt/y).

POLYSAR FRANCE SA.

Strasbourg. Feed: acrylonitrile, benzene, butadiene, ethylene. Products: SBR latex, nitrile rubber (160,000 mt/y).

RHONE POULENC

Pardies. Feed: natural gas, methanol. Products: acetic acid (300,000 mt/y), vinyl acetate (160,000 mt/y).

Pont de Claix. Product: bisphenol A (60,000 mt/y).

Roussillon. Feed: acetic acid, benzene, propylene. Products: acetic anhydride (80,000 mt/y), acetone (60,000 mt/y), cumene (145,000 mt/y), phenol (100,000 mt/y).

Saint-Fons (Belle-Etoile). Feed: paraxylene. Product: dimethyl terephthalate (70,000 mt/y).

SHELL CHIMIE

Berre l'Etang. Feed: gas oil, LPG, naphtha. Products: acetone (75,000 mt/y), benzene (60,000 mt/y), butadiene (75,000 mt/y), ethylene (380,000 mt/y), isopropanol (108,000 mt/y), ld polyethylene (110,000 mt/y), linear alkylbenzene (40,000 mt/y), methyl isobutyl ketone (26,000 mt/y), polypropylene (120,000 mt/y), polystyrene (50,000 mt/y), polyvinyl chloride (145,000 mt/y), propylene (225,000 mt/y), toluene (12,000 mt/y), BR (33,000 mt/y), SBR (85,000 mt/y), TR (45,000 mt/y).

SOCABU-SOCIETE DU CAOUTCHOUC BUTYL

Notre Dame de Gravenchon. Feed: refinery products. Products: butyl rubber (52,000 mt/y), ethylene-propylene rubber (50,000 mt/y).

SOCIÉTÉ ARTESIENNE DE VINYLE
(DSM subsidiary)

Mazingarbe. Product: polyvinyl chloride (195,000 mt/y).

SOCIÉTÉ CHIMIQUE DE DIEUZE
(100% CdF Chimie EP)

Dieuze. Feed: styrene. Product: polystyrene (75,000 mt/y).

Ribecourt. Feed: styrene. Product: polystyrene (110,000 mt/y).

SOCIÉTÉ DES ENGRAIS DE L'ILE DE FRANCE
(50% CdF Chimie AZF, 50% Grande Paroisse)

Nangis. Feed: natural gas. Product: ammonia (300,000 mt/y).

SOCIÉTÉ DU CHLORURE DE VINYLE DE FOS
(60% Shell Chimie, 40% Atochem)

Fos sur Mer (Bouches du Rhône). Feed: chlorine, ethylene. Product: vinyl chloride (200,000 mt/y).

SOCIÉTÉ DU POLYETHYLENE DE FOS
(100% Shell)

Fos sur Mer (Bouches du Rhone). Feed: ethylene. Product: ld polyethylene (100,000 mt/y).

SOCIÉTÉ FRANCAISE EXXON CHEMICAL

Notre Dame de Gravenchon. Feed: refinery products. Products: butadiene (70,000 mt/y), ethylene (300,000 mt/y), propylene (220,000 mt/y), solvents (60,000 mt/y).

SOCIÉTÉ FRANCAISE HOECHST

Cuise-LaMotte. Feed: methanol. Product: formaldehyde (12,000 mt/y).

Lillebonne. Feed: ethylene. Product: acetaldehyde (98,000 mt/y), polypropylene (70,000 mt/y).

SOCIÉTÉ NORMANDE DE L'AZOTE
(56% Cofaz, 44% CdF Chimie AZF)

Gonfreville. Feed: naphtha, natural gas. Products: ammonia (330,000 mt/y), urea (250,000 mt/y).

SODES—Société d'Ethanol de Synthèse
(23.5% Atochem, 34% SFECI, 31% Beghin Say)

Lillebonne. Product: ethanol (120,000 mt/y), ether (10,000 mt/y).

SOLVAY & CIE.

Sarralbe. Feed: ethylene, propylene. Products: hd polyethylene, polypropylene.

Tavaux. Feed: ethylene. Products: polyvinyl chloride, vinyl chloride.

UNITED CHEMICAL FRANCE

Port Jerome. Feed: aromatic oils. Product: carbon black (88,000 mt/y).

GERMANY

BASF AG

Ludwigshafen. Feed: fuel oil, naphtha, natural gas. Products: acetic acid (40,000 mt/y), acetylene (85,000 mt/y), acrylic acid (210,000 mt/y), ammonia (700,000 mt/y), butanols (220,000 mt/y), caprolactam (150,000 mt/y), ethylbenzene (350,000 mt/y), ethylene (450,000 mt/y), ethylene oxide (150,000 mt/y), formaldehyde (1,200,000 mt/y), melamine (40,000 mt/y), methanol (240,000 mt/y), higher oxoalcohols (100,000 mt/y), 2-ethylhexanol (150,000 mt/y), phthalic anhydride (90,000 mt/y), polyamide (worldwide—105,000 mt/y), ld polyethvlene (18,000 mt/y), polyisobutylene (6,000 mt/y), polypropylene (10,000 mt/y), polystyrene (315,000 mt/y), polyvinyl chloride (150,000 mt/y), propanol (25,000 mt/y), propylene (240,000 mt/y), propylene glycol (40,000 mt/y), propylene oxide (75,000 mt/y), styrene (500,000 mt/y), urea (480,000 mt/y), vinyl chloride (100,000 mt/y), plasticizers (220,000 mt/y).

BAYER AG

Dormagen. Products: acrylonitrile-butadiene-styrene (115,000 mt/y), polyamide (50,000 mt/y).

Uerdingen. Products: bisphenol A (707,000 mt/y), formaldehyde (95,000 mt/y), maleic anhydride (12,000 mt/y), phthalic anhydride (60,000 mt/y), SBR (45,000 mt/y).

BP BENZIN UND PETROLEUM AG UND CALIFORNIA CHEMICAL GmbH oHG.
(owned jointly by Chevron Chemical Company and BP Benzin und Petroleum AG)

Dinslaken. Feed: reformate. Products: orthoxylene (24,000 mt/y), paraxylene (20,000 mt/y).

CHEMISCHE WERKE SAARLOTHRINGEN
(100% CdF Chimie)

Perl/Besch. Feed: ammonia. Products: formaldehyde (44,000 mt/y), urea (200,000 mt/y), resins (12,000 mt/y).

COLUMBIAN CARBON DEUTSCHLAND

Hamburg. Feed: oil. Product: aromatics mix (40-80,000 mt/y), carbon black (35,000 mt/y).

CONDEA CHEMIE GmbH
(owned by Conoco Inc. and Deutsche Texaco AG)

Brunsbüttel. Feed: ethylene, hydrogen. Products: synthetic straight chain primary fatty alcohols (75,000 mt/y).

DEGUSSA AG

Bruchhausen. Feed: methyl alcohol. Product: formaldehyde.

Kalscheuren. Feed: aromatic hydrocarbons, coal tar oil. Product: carbon black.

Mainz-Mombach. Feed: methyl alcohol. Product: formaldehyde.

DEUTSCHE EXXON CHEMICAL GmbH

Cologne. Feed: raffinate 1 (spent butenes). Products: butylenes (35,000 mt/y), polyisobutylene (45,000 mt/y).

DEUTSCHE MARATHON PETROLEUM GmbH
(subsidiary of OEMV AG, Vienna, Austria)

Burghausen, Bavaria. Feed: refinery streams. Products: benzene (120,000 mt/y), butadiene-C_4 cut (90,000 mt/y), ethylene (280,000 mt/y), propylene (130,000 mt/y).

DEUTSCHE SHELL AG

Cologne-Godorf. Feed: pyrolysis gasoline, reformate. Products: benzene (400,000 mt/y), orthoxylene (100,000 mt/y), paraxylene (75,000 mt/y), toluene (220,000 mt/y).

DEUTSCHE SOLVAY-WERKE GmbH

Rheinberg. Feed: ethylene. Products: polyvinyl chloride, vinyl chloride.

DEUTSCHE TEXACO AG

Heide. Feed: refinery products. Products: benzene (40,000 mt/y), butylenes (28,000 mt/y), ethylbenzene (11,000 mt/y), ethylene (80,000 mt/y), MTBE (12,500 mt/y), orthoxylene (15,000 mt/y), parametaxylene (38,000 mt/y), propylene (55,000 mt/y), toluene (25,000 mt/y).

Meerbeck und Duisburg. Feed: refinery products and chemicals. Products: acetone (36,000 mt/y), alkylbenzene (25,000 mt/y), alkyl chlorides (2,000 mt/y), isopropanol (140,000 mt/y), maleic anhydride (7,500 mt/y), plasticizers (24,000 mt/y), resins (36,000 mt/y), ketones (99,000 mt/y).

DOW CHEMICAL

Rheinmuenster. Products: SB-latex, resins.

Stade. Products: bisphenol, propylene oxide, propylene glycol, resins, solvents.

EC ERDOLCHEMIE GmbH
(owned by Bayer AG and Deutsche BP AG)

Worringen, Cologne. Feed: naphtha. Products: acrylonitrile (280,000 mt/y), ammonia (300,000 mt/y), benzene (200,000 mt/y), butadiene (245,000 mt/y), butylenes (90,000 mt/y), ethanol (40,000 mt/y), ethylene (740,000 mt/y), ethylene glycol (150,000 mt/y), ethylene oxide (150,000 mt/y), isoamylene (8,000 mt/y), propylene (520,000 mt/y), propylene glycol (24,000 mt/y), propylene oxide (150,000 mt/y), toluene (100,000 mt/y).

EVC
(50% ICI, 50% Enichem)

Waldshut. Product: polyvinyl chloride (25,000 mt/y).

Wilhelmshaven. Product: polyvinyl chloride (150,000 mt/y).

HOECHST AG

Frankfurt. Feed: ethylene, propylene, natural gas. Products: acetaldehyde (140,000 mt/y), acetic acid (180,000 mt/y), hd polyethylene (130,000 mt/y), polyvinyl alcohol (25,000 mt/y), vinyl acetate (150,000 mt/y).

Gendorf. Feed: ethylene. Products: ethylene glycol (100,000 mt/y), ethylene oxide (120,000 mt/y), polyvinyl chloride (150,000 mt/y), vinyl chloride (160,000 mt/y).

Gersthofen. Feed: p-xylene, methanol. Product: dimethyl terephthalate (130,000 mt/y).

Kelsterbach. Feed: olefins. Products: ethylene glycol-ethylene oxide (45,000 mt/y), polypropylene (125,000 mt/y).

Knapsack. Feed: olefins. Products: acetaldehyde (150,000 mt/y), acetic acid (70,000 mt/y), acetic anhydride (100,000 mt/y), polypropylene (85,000 mt/y), hd polyethylene (100,000 mt/y), polyvinyl chloride (90,000 mt/y), vinyl chloride (100,000 mt/y).

Muenchsmuenster. Feed: ammonia, ethylene, propylene. Products: acrylonitrile (90,000 mt/y), hd polyethylene (75,000 mt/y).

Offenbach. Feed: p-xylene, methanol. Product: dimethyl terephthalate (95,000 mt/y).

HÜLS

Marl. Products: acetaldehyde (80,000 mt/y), acetic acid (40,000 mt/y), acetylene (120,000 mt/y), alkylbenzene (80,000 mt/y), butanol-n-isobutanol (130,000 mt/y), butylenes (30,000 mt/y), butyraldehyde (310,000 mt/y), cumene (110,000 mt/y), dimethyl terephthalate (410,000 mt/y), ethanol (130,000 mt/y), ethylbenzene (300,000 mt/y), ethylchloride (30,000 mt/y), ethylene (50,000 mt/y), ethylene dichloride (250,000 mt/y), ethylene glycol (90,000 mt/y), ethylene oxide (150,000 mt/y), isopropanol (110,000 mt/y), maleic anhydride (35,000 mt/y), oxoalcohols-octanol (200,000 mt/y), phthalic anhydride (150,000 mt/y), plasticizers (190,000 mt/y), polyamide-12 (14,000 mt/y), polyester (21,000 mt/y), polyethylene (160,000 mt/y), polypropylene (120,000 mt/y), polystyrene (135,000 mt/y), polyvinyl chloride (380,000 mt/y), propylene glycol (22,000 mt/y), propylene oxide (27,000 mt/y), styrene (250,000 mt/y).

HÜLS TROISDORF AG

Luisdorf. Products: dimethyl terephthalate (150,000 mt/y), ethylene dichloride (85,000 mt/y).

Steyerberg. Product: dimethyl terephthalate (180,000 mt/y).

NORSK HYDRO RUHR

Brunsbüttel. Feed: heavy fuel oil. Products: ammonia (585,000 mt/y), urea (330,000 mt/y).

PHENOLCHEMIE GmbH

Gladbeck. Feed: cumene. Products: acetone (250,000 mt/y), phenol (400,000 mt/y).

PHILLIPS PETROLEUM INTERNATIONAL GmbH

Hannover. Product: carbon black (50,000 mt/y).

RHEINISCHE OLEFINWERKE GmbH
(Shell 50%, BASF 50%)

Wesseling. Feed: gas oil, naphtha. Products: butadiene (150,000 mt/y), ethylene (650,000 mt/y), ethylbenzene (430,000 mt/y), ld polyethylene (400,000 mt/y), hd polyethylene (215,000 mt/y), polyisobutylene (8,000 mt/y), polypropylene (120,000 mt/y), propylene (310,000 mt/y), styrene (420,000 mt/y), SB rubber (30,000 mt/y), thermoplastic rubber (45,000 mt/y).

RUHRCHEMIE AG

Oberhausen, Holten. Feed: olefins. Products: hd polyethylene (125,000 mt/y), oxoalcohols (365,000 mt/y).

RUHR OEL GMBH
(50% Veba Oel AG, 50% Petróleos de Venezuela SA)

Gelsenkirchen. Feed: gas oil, naphtha, distil resid. Products: ammonia (400,000 mt/y), benzene (320,000 mt/y), cumene (330,000 mt/y), cyclohexane (100,000 mt/y), ethylene (400,000 mt/y), methanol (200,000 mt/y), orthoxylene (110,000 mt/y), n-paraffins (100,000 m/ty), paraxylene (120,000 mt/y), propylene (245,000 mt/y), toluene (90,000 mt/y).

Münchsmünster. Feed: LPG, naphtha. Products: ethylene (200,000 m/ty), propylene (130,000 mt/y).

UNION RHEINISCHE BRAUNKOHLEN KRAFTSTOFF AG

Wesseling. Feed: LPG, natural gas, pyrolysis gasoline, reformate, resid, refinery gas, xylene mix. Products: benzene (120,000 mt/y), ethylene (440,000 mt/y), methanol (400,000 mt/y), orthoxylene (32,000 mt/y), paraxylene (72,000 mt/y), propylene (260,000 mt/y), toluene (80,000 mt/y), xylene mix (62,000 mt/y).

WACKER-CHEMIE GmbH

Burghausen/Obb. Feed: ethylene. Products: acetaldehyde, acetic acid, acetic anhydride, ethylene dichloride, plasticizers, polyvinyl acetate, polyvinyl alcohol, polyvinyl chloride, vinyl acetate, vinyl chloride, solvents.

WINTERSHALL AG

Ibbenbüren. Feed: benzene, chlorine, n-paraffins. Product: alkylbenzene (36,000 mt/y).

Lingen-Ems. Feed: reformate, benzene-hydrogen, kerosine. Products: benzene (72,000 mt/y), cyclohexane (100,000 mt/y), normal paraffins (30,000 mt/y).

Mannheim. Feed: pyrolysis-gasoline, reformate. Products: benzene (270,000 mt/y).

GREECE

DOW CHEMICAL

Lavrion. Product: polystyrene.

EKO CHEMICALS CO. AE

Thessaloniki. Feed: naphtha, refinery cuts, vinyl chloride. Products: ammonia (120,000 mt/y), ethylene (15,000 mt/y), ethylene dichloride (35,000 mt/y), normal paraffins (45,000 mt/y), polyvinyl chloride (70,000 mt/y).

HADJILUCAS SA

Halkis. Feed: methanol. Product: formaldehyde (20,000 mt/y).

HUNGARY

BORSODI VEGYI KOMBINÁT

Kazincbarcika. Feed: ethylene, natural gas. Products: ammonia (220,000 mt/y), ethylene dichloride (170,000 mt/y), polyamide (1,300 mt/y), polyvinyl chloride (190,000 mt/y), urea (120,000 mt/y), vinyl chloride (170,000 mt/y).

CHEMOKOMPLEX

Kazincbarcika. Product: vinyl chloride monomer (185,000 mt/y).

HUNGARIAN OIL AND GAS TRUST

Százhalombatta. Feed: pyrolysis gasoline, reformate, vac gas oil (FCC unit). Products: benzene (110,000 mt/y), maleic anhydride (10,000 mt/y), orthoxylene (52,000 mt/y), propylene (42,000 mt/y), toluene (110,000 mt/y), xylene mix (48,000 mt/y).

TISZAI VEGYI KOMBINÁT

Leninváros. Feed: naphtha, natural gas. Products: ammonia (265,000 mt/y), butadiene (80,000), ethylene (250,000 mt/y), ld polyethylene (210,000 mt/y), polypropylene (105,000 mt/y), propylene (125,000 mt/y).

INDIA

ADARSH CHEMICALS & FERTILIZERS LTD.

Udhna, Gujarat. Feed: benzene. Product: maleic anhydride (3,000 mt/y).

AHMEDABAD MANUFACTURING & CALICO PRINTING CO. LTD.

Baroda. Feed: dimethyl terephthalate, ethylene glycol. Product: polyester (7,968 mt/y).

BAKELITE HYLAM LTD.

Nacharam, Hyderabad. Feed: methanol. Product: formaldehyde (3,000 mt/y).

Sanathnagar, Hyderabad. Feed: phenol, formaldehyde, styrene, maleic-phthalic anhydride, isophthalic acid, propylene glycol. Products: phenolic resins (2,000 mt/y), polyester resins (1,800 mt/y).

BOMBAY DYEING AND MANUFACTURING CO. LTD.

Bombay. Product: dimethyl terephthalate (60,000 mt/y).

BONGAIGAON REFINERY & PETROCHEMICALS LTD.

Dhaligaon, Assam. Feed: 110-145°C cut naphtha TBP. Products: aromatics mix (10,000 mt/y), dimethyl terephthalate (45,000 mt/y), orthoxylene (6,000 mt/y), paraxylene (29,000 mt/y), polyester staple fiber (30,000 mt/y).

CHEMICALS & PLASTICS INDIA LTD.

Krishnagiri. Feed: molasses. Product: ethanol (12,000 mt/y).

Metturdam. Feed: chlorine, ethanol. Products: ethylene (18,700 mt/y), ethylene dichloride (37,000 mt/y), polyvinyl chloride (21,300 mt/y), vinyl chloride (22,000 mt/y).

CHEMIDYE MANUFACTURING CO. LTD.

Tamil Nadu. Feed: phthalic anhydride. Products: solvents (5,000 mt/y), plasticizers (5,000 mt/y).

COROMANDEL FERTILIZERS LTD.

(International Minerals & Chemicals Corp., Chevron Chemical Corp., E.I.D. Parry (India) Ltd.)

Visakhapatnam, Andhra Pradesh. Feed: naphtha. Products: ammonia (114,240 mt/y), urea (125,600 mt/y).

FERTILIZER CORP. OF INDIA LTD.

Gorakhpur, Uttar Pradesh. Feed: naphtha. Products: ammonia (171,000 mt/y), urea (285,000 mt/y).

Ramagundam, Andhra Pradesh. Feed: coal. Products: ammonia (297,000 mt/y), urea (495,000 mt/y).

Sindri, Bihar. Feed: fuel oil. Products: ammonia (297,000 mt/y), urea (330,000 mt/y).

Talcher, Orissa. Feed: coat. Products: ammonia (297,000 mt/y), urea (495,000 mt/y).

FERTILIZERS AND CHEMICALS, TRAVANCORE LTD. (FACT) and FACT ENGINEERING AND DESIGN ORGANIZATION (FEDO)

Ambalamedu (near Cochin), **Kerala.** Feed: naphtha. Products: ammonia (198,000 mt/y), urea (330,000 mt/y).

Udyogamandal (near Cochin), Kerala. Feed: naphtha. Products: ammonia (112,200 mt/y).

GARWARE NYLONS LTD.

Pimpri, Poona. Feed: caprolactam, dimethyl terephthalate, ethylene glycol. Products: nylon 6 (4,830 mt/y), polyamide (360 mt/y), polyester (1,576 mt/y).

GUJARAT NARMADA VALLEY FERTILIZERS CO. LTD.

Narmadanagar, Bharuch. Feed: fuel oil. Products: ammonia (1,350 mt/d), methanol (60 mt/d), urea (1,800 mt/d).

GUJARAT STATE FERTILIZERS CO. LTD.

Fertilizernagar (near Baroda). Feed: acetone, benzene, caprolactam, fuel oil, hydrogen cyanide, naphtha, natural gas, urea. Products: ammonia (348,000 mt/y), caprolactam (20,000 mt/y), melamine (5,000 mt/y), nylons (4,000 mt/y), urea (370,800 mt/y).

HERDILLIA CHEMICALS LTD.

Thane, Bombay. Feed: benzene, orthoxylene, propylene, 2-ethyl hexanol. Products: acetone (12,000 mt/y), cumene (29,800 mt/y), phenol (20,000 mt/y), phthalic anhydride (8,600 mt/y), plasticizers (8,500 mt/y), solvents (2,400 mt/y), styrene (900 mt/y).

HINDUSTAN FERTILIZER CORP. LTD.

Barauni (Bihar). Feed: naphtha. Products: ammonia (600 mt/d), urea (1,000 mt/d).

Durgapur. Feed: naphtha. Products: ammonia (600 mt/d), urea (1,000 mt/d).

Namrup (Assam). Feed: natural gas. Products: ammonia (1,400 mt/d), urea (2,167 mt/d).

HINDUSTAN ORGANIC CHEMICALS LTD.

(Government of India enterprise)

Rasayani and Cochin. Products: acetic acid (1,330 mt/y), acetic anhydride (2,000 mt/y), acetone (24,640 mt/y), formaldehyde (15,000 mt/y), phenol (40,000 mt/y), propylene (7,000 mt/y).

IEL LTD.

Kanpur, Uttar Pradesh. Feed: naphtha. Products: ammonia (411,000 mt/y), urea (675,000 mt/y).

ILAC LTD.

(100% Ahmedabad Mfg. & Calico Printing Co. Ltd.)

Bombay. Feed: acetylene. Product: polyvinyl chloride (25,000 mt/y), vinyl chloride (6,500 mt/y).

INDIAN FARMERS FERTILIZER COOPERATIVE LTD.

Aonla, Bareilly. Feed: natural gas. Products: ammonia (445,500 mt/y), urea (726,000 mt/y).

Kalol, Gujarat. Feed: natural gas. Products: ammonia (300,300 mt/y), urea (396,000 mt/y).

Phulpur, Uttar Pradesh. Feed: ammonia. Products: ammonia (297,000 mt/y), urea (495,000 mt/y).

INDIAN OIL CORP. LTD.

Gujarat, Baroda. Feed: reformate. Products: benzene (50,000 mt/y), toluene (20,000 mt/y).

INDIAN PETROCHEMICALS CORP. LTD.

Baroda, Gujarat. Feed: naphtha. Products: acrylic acid-esters (10,000 mt/y), acrylonitrile (30,000 mt/y), alkylbenzene (30,000 mt/y), aromatics (23,600 mt/y), aromatic hydroarbon resins (5,000 mt/y), aromatic solvent (12,000 mt/y), benzene (23,600 mt/y), bicomponent acrylic fiber (12,000 mt/y), butadiene (22,000 mt/y), carbon black feedstock (17,900 mt/y), dimethyl terephthalate (30,000 mt/y), ethylene (130,000 mt/y), ethylene dichloride (100,000 mt/y), ethylene glycol (20,000 mt/y), ethylene oxide (5,000 mt/y), normal paraffins (25,000 mt/y), orthoxylene-mixed xylene (23,500 mt/y), paraxylene (17,000 mt/y), polybutadiene rubber (20,000 mt/y), ld polyethylene (80,000 mt/y), polypropylene (30,000 mt/y), polypropylene (Copol) 25,000 mt/y), polyvinyl chloride (55,000 mt/y), propylene (81,300 mt/y), pyrolysis gasoline (63,900 mt/y), solvents (20,000 mt/y), vinyl chloride (57,300 m/ty).

MADRAS FERTILIZERS LTD.

Manali. Feed: sr naphtha. Products: ammonia (247,500 mt/y), urea (292,000 mt/y).

McDOWELL & CO. LTD. (Polymers Division)

Visakhapatnam. Feed: benzene, molasses. Products: ethylene (3,300 mt/y), styrene (15,000 mt/y), polystyrene (14,500 mt/y).

MYSORE PETROCHEMCIALS LTD.

Raichur, Karnataka. Feed: orthoxylene. Product: phthalic anhydride (10,230 mt/y).

NAGARJUNA FERTILIZERS AND CHEMICALS LTD.

Kakinada. Feed: naphtha, natural gas. Products: ammonia (900 mt/d), toluene (1,500 mt/d).

NATIONAL FERTILIZERS LTD.

Bhatinda, Punjab. Feed: fuel oil, low sulfur heavy stock. Products: ammonia (297,000 mt/y), urea (511,500 mt/y).

Naya Nangal, Punjab. Feed: fuel oil, low sulfur heavy stock. Products: ammonia (297,000 mt/y), methanol (16,500 mt/y), urea (330,000 mt/y).

Panipat, Haryana. Feed: fuel oil, low sulfur heavy stock. Products: ammonia (297,000 mt/y), urea (511,500 mt/y).

NATIONAL ORGANIC CHEMICAL INDUSTRIES LTD.

Thane. Feed: naphtha. Products: acetone (15,000 mt/y), benzene (17,000 mt/y), butadiene (7,200 mt/y), butanol (20,000 mt/y), ethylene (63,000 mt/y), ethylene dichloride (50,000 mt/y), ethylene glycol (11,000 mt/y), ethylene oxide (14,000 mt/y), isopropanol (21,000 mt/y), methyl isobutyl ketone (4,000 mt/y), oxoalcohols (10,000 mt/y), polyethlene glycol (2,000 mt/y), polyvinyl chloride (22,000 mt/y), propylene (37,000 mt/y), vinyl chloride (30,000 mt/y).

PHILLIPS CARBON BLACK LTD.

(owned by Phillips Petroleum, Duncan Bros. Co. Ltd., and public)

Durgapur, West Bengal. Feed: heavy oil. Product: carbon black (40,000 mt/y).

POLYCHEM LTD.

Baroda. Feed: acrylonitrile, butadiene, styrene. Product: ABS (2,500 mt/y).

Bombay. Feed: alcohol, benzene, ethylene. Products: ethylbenzene (20,000 mt/y), ethylene (3,000 mt/y), polystyrene (16,000 mt/y), styrene (17,500 mt/y).

Nira (Maharashtra). Feed: acetic acid, alcohol, ethanol, molasses, oxygen. Products: ethanol (8,000 mt/y), ethylene (4,000 mt/y), vinyl acetate (10,000 mt/y).

POLYOLEFINS INDUSTRIES LTD. (PIL).

Thane, Maharashtra. Feed: ethylene. Product: hd polyethylene (50,000 mt/y).

RASHTRIYA CHEMICALS & FERTILIZERS LTD.

Chembur, Bombay. Feed: associated gas, naphtha. Products: ammonia (402,600 mt/y), methanol (36,000 mt/y), urea (429,000 mt/y).

Thal, Alibag. Feed: associated gas. Products: ammonia (891,000 mt/y), urea (1,485,000 mt/y).

SHRI AMBUJA PETROCHEMICALS LTD.

Patancheru, Medak District. Feed: orthoxylene. Product: phthalic anhydride (10,000 mt/y).

SHRIRAM FERTILIZERS AND CHEMICALS

Shriram Nagar, Kota. Feed: naphtha, acetylene. Products: ammonia (200,000 mt/y), polyvinyl chloride (33,000 mt/y), urea (330,000 mt/y).

SOUTHERN PETROCHEMICAL INDUSTRIES CORP. LTD.

Tuticorin, Tamil Nadu. Feed: naphtha. Products: ammonia (352,000 mt/y), urea (512,000 mt/y).

SYNTHETICS AND CHEMICALS LTD.

(with Kilachand Devchand & Co. and Firestone Tire & Rubber Co.)

Bareilly, Uttar Pradesh. Feed: alcohol, benzene, petrobutadiene. Products: ethylene (4,000 mt/y), styrene (11,250 mt/y), NBR (2,000 mt/y), SBR (33,000 mt/y).

THIRUMALAI CHEMICALS LTD.

Ranipet, Tamil Nadu. Feed: orthoxylene. Products: maleic anhydride (1,000 mt/y), phthalic anhydride (28,000 mt/y).

UNITED CARBON INDIA LTD.

Thane. Feed: lube extracts, naphtha cracker bottoms. Product: carbon black (35,700 mt/y).

ZUARI AGRO CHEMICALS LTD.
(Birla Gwalior Pvt. Ltd. and public interests)

Zuarinagar. Feed: naphtha. Products: ammonia (220,000 mt/y), urea (340,000 mt/y).

INDONESIA

PERTAMINA
(state oil company)

Bunyu, East Kalimantan. Feed: natural gas. Product: methanol (330,000 mt/y).

Plaju, South Sumatra. Feed: paraxylene, propylene. Product: polypropylene (10,000 mt/y), terephthalic acid (150,000 mt/y).

PERUM PETROKIMIA GRESIK.

Gresik, Surabaya. Feed: fuel oil. Products: ammonia (3,600 mt/y), urea (45,000 mt/y).

P.T. PUSRI

Palembang, South Sumatra. Feed: natural gas. Product: urea (480,000 mt/y).

P.T. PUPUK KUJANG

Cikampek, Java. Feed: natural gas. Products: ammonia (330,000 mt/y), urea (570,000 mt/y).

IRELAND

IRISH FERTILIZER INDUSTRIES LTD.

Dublin. Products: ammonia (435,000 mt/y), urea (330,000 mt/y), calcium ammonium nitrate.

ISRAEL

ELECTROCHEMICAL INDUSTRIES (FRUTAROM) LTD.

Near Ako. Feed: ethylene. Products: ethylene dichloride (160,000 mt/y), polyvinyl chloride (90,000 mt/y), vinyl chloride (100,000 mt/y).

FERTILIZERS & CHEMICALS LTD.

Haifa. Feed: LP-gas, naphtha, Bunker C. Products: ammonia (80,000 mt/y), urea (40,000 mt/y).

GADOT PETROCHEMICAL INDUSTRIES LTD.

Haifa Bay. Feed: reformate, pyrolysis gasoline, aromatic streams. Products: aromatics mix (150,000 mt/y), benzene (40,000 mt/y), normal paraffins (40,000 mt/y), orthoxylene (18,000 mt/y), paraxylene (22,000 mt/y), phthalic anhydride (20,000 mt/y), toluene (50,000 mt/y), xylene mix (60,000 mt/y).

ISRAEL PETROCHEMICAL ENTERPRISES LTD.

Haifa. Feed: ethylene, styrene. Products: ld polyethylene (100,000 mt/y), polystyrene (16,000 mt/y).

ITALY

AGRIMONT SpA
(Montedison Group)

Ferrara. Feed: natural gas. Products: ammonia (490,000 mt/y), urea (550,000 mt/y).

Porto Marghera. Feed: natural gas. Products: ammonia (175,000 mt/y), urea (180,000 mt/y).

Priolo. Feed: natural gas. Products: ammonia (330,000 mt/y), urea (200,000 mt/y).

San Giuseppe di Cairo. Feed: natural gas. Products: ammonia (170,000 mt/y), urea (200,000 mt/y).

ALUSUISSE ITALIA SpA

Arezzo. Products: plasticizers (64,000 mt/y), polyester resins (40,000 mt/y), solvents (14,000 mt/y).

Bergamo. Products: fumaric acid (20,000 mt/y), maleic anhydride (38,000 mt/y), phthalic anhydride (80,000 mt/y).

ASHLAND CHEMICAL ITALIANA SpA

Milan. Products: acrylics (1,000 mt/y), alkyds (8,000 mt/y).

AUSIND SpA
(Montedison Group)

Castellanza. Feed: natural gas. Products: formaldehyde (300,000 mt/y), melamine (26,000 mt/y), methanol (120,000 mt/y), urea (100,000 mt/y).

CABOT ITALIANA SpA
(subsidiary of Cabot Corp., Waltham, Mass.)

Ravenna. Feed: petroleum fractions, aromatic tar. Product: carbon black (75,000 mt/y).

CHIMICA DEL FRIULI
(Snia Viscosa group)

Torviscosa (Udine). Product: caprolactam (20,000 mt/y).

CHIMICA DEL TIRSO
(50% EniChem, 50% Montefibre)

Ottana (Sardinia). Feed: paraxylene. Product: terephthalic acid (80,000 mt/y).

CHIMICA DI COLLEFERRO SpA
(Snia Viscosa group)

Colleferro. Product: polyester (40,000 mt/y).

COLUMBIAN CARBON EUROPA SpA

Trecate. Feed: heavy aromatic hydrocarbons. Product: furnace carbon black (50,000 mt/y).

DISTILLERIE ITALIANE
(Alusuisse Italia SpA)

San Giovanni Valdarno (Arezzo). Products: phthalic anhydride (25,000 mt/y), polyester (40,000 mt/y), plasticizers (75,000 mt/y).

DOW ITALIA SpA

Livorno. Products: ABS, polystyrene, SB-latex.

DUTRAL
(Montedison Group)

Ferrara. Product: EPR (60,000 mt/y).

ENICHEM

Gela. Feed: naphtha, natural gas. Products: acrylonitrile (90,000 mt/y), ammonia (220,000 mt/y), aromatics (150,000 mt/y), benzene (80,000 mt/y), butadiene (40,000 mt/y), ethylene (310,000 mt/y), ethylene dichloride (125,000 mt/y), ethylene glycol (46,000 mt/y), ethylene oxide (40,000 mt/y), ld polyethylene (90,000 mt/y), hd polyethylene (40,000 mt/y), polypropylene (50,000 mt/y), propylene (160,000 mt/y), toluene (90,000 mt/y), urea (200,000 mt/y), xylene mix (80,000 mt/y).

Manfredonia. Feed: natural gas. Products: ammonia (360,000 mt/y), urea (630,000 mt/y).

Pisticci. Feed: natural gas. Products: acrylic esters (7,000 mt/y), methanol (65,000 mt/y).

Ragusa. Feed: ethylene. Product: ld polyethylene (140,000 mt/y).

Ravenna. Feed: natural gas. Products: acetic acid (30,000 mt/y), acetylene (60,000 mt/y), ammonia (310,000 mt/y), butadiene (100,000 mt/y), isoprene (30,000 mt/y), polybutadiene (45,000 mt/y), polyisoprene (30,000 mt/y), polyvinyl acetate (25,000 mt/y), styrene (41,000 mt/y), urea (70,000 mt/y), vinyl acetate (30,000 mt/y), ABS (40,000 mt/y), SBR (150,000 mt/y), SBR latex (30,000 mt/y), nitrile (8,000 mt/y), solvents (100,000 mt/y).

FAR—Fabrica Adesivi Resine

Filago, Bergamo District. Products: formaldehyde (100,000 mt/y), acrylics (20,000 mt/y), polyvinyl acetate (25,000 mt/y).

FTALITAL
(Alusuisse Italia SpA)

Scanzorosciate (Bergamo). Feed: benzene, butane, naphthalene, orthoxylene. Products: maleic anhydride (38,000 mt/y), phthalic anhydride (80,000 mt/y).

ICAM
(100% EniChem)

Priolo. Feed: naphtha, gas oil. Products: ethylene (600,000 mt/y), propylene.

HIMONT ITALIA

Brindisi. Feed: propylene. Product: polypropylene (150,000 mt/y).

Ferrara. Feed: propylene. Product: polypropylene (120,000 mt/y).

Terni. Feed: propylene. Product: polypropylene (180,000).

MOBIL CHIMICA ITALIANA

Naples. Feed: light naphtha, hp reformate. Products: benzene (150,000 mt/y), cyclohexane (55,000 mt/y), orthoxylene (55,000 mt/y), paraxylene (80,000 mt/y), xylene mix (35,000 mt/y).

MONTEDIPE
(Montedison Group)

Ferrara. Product: polyester (6,500 mt/y).

Mantova. Products: acetone (140,000 mt/y), ethylbenzene (350,000 mt/y), ethylene dichloride (200,000 mt/y), maleic anhydride (11,000 mt/y), phenol (230,000 mt/y), polystyrene (270,000 mt/y), styrene (350,000 mt/y).

Porto Marghera. Products: acetic acid (65,000 mt/y), acetylene (40,000 mt/y), caprolactam (100,000 mt/y), ethylene (350,000 mt/y), propylene (180,000 mt/y), vinyl acetate (55,000 mt/y).

Priolo. Products: acetaldehyde (140,000 mt/y), ethylene dichloride (190,000 mt/y), ethylene oxide (15,000 mt/y), propylene glycol (13,000 mt/y), propylene oxide (40,000 mt/y).

Villadossola. Products: acrylics (11,000 mt/y), polyvinyl alcohol (2,000 mt/y), polyvinyl acetate (64,000 mt/y), polyvinyl acetate-ethylene (25,000 mt/y).

SARAS CHIMICA
(60% EniChem, 20% Saras, 20% Montedison)

Sarroch (Sardinia). Feed: refinery feedstock. Products: cumene (200,000 mt/y), ethylbenzene (40,000 mt/y), n-paraffins (160,000 mt/y), orthoxylene (80,000 mt/y), paraxylene (80,000 mt/y).

SARPOM

Trecate (Novara). Feed: intermediate and heavy virgin naphtha. Products: aromatics mix (18,000 mt/y), cyclohexane (3,000 mt/y), normal paraffins (69,000 mt/y).

SELM-Societa Energia Montedison
(Montedison Group)

Priolo. Feed: naphtha, pyrolysis gasoline, propylene. Products: benzene (350,000 mt/y), cumene (270,000 mt/y), ethylbenzene (70,000 mt/y), orthoxylene (75,000 mt/y), paraxylene (130,000 mt/y), toluene (200,000 mt/y).

SOCIETA CHIMICA DAUNA
(50% EniChem, 50% Snia Viscosa)

Manfredonia, Foggia. Feed: toluene. Product: caprolactam (80,000 t/y).

SOLVAY & CIE. SA

Ferrara. Feed: vinyl chloride monomer. Products: polyvinyl chloride.

Rosignano. Feed: ethylene. Product: hd polyethylene.

TECNOPOLIMERI SpA
(Snia Viscosa group)

Ceriano Laghetto (Milan). Feed: caprolactam, PA66. Product: polyamide (27,000 mt/y).

TERNI INDUSTRIE CHIMICHE SpA

Nera Montoro (Terni). Feed: natural gas. Products: ammonia (120,000 mt/y), urea (100,000 mt/y).

VEDRIL
(Montedison Group)

Rho. Feed: ach. Product: acrylics (65,000 mt/y).

JAPAN

ASAHI CHEMICAL INDUSTRY CO. LTD.

Kawasaki. Products: acrylic esters (20,000 mt/y), acrylonitrile (89,760 mt/y), acrylics (26,950 mt/y), polystyrene (55,200 mt/y), styrene (65,000 mt/y), BR-SBR rubber (129,000 mt/y).

Mizushima. Products: acrylonitrile (128,700 mt/y), ammonia (264,000 mt/y), hd polyethylene (82,000 mt/y), ld polyethylene (96,000 mt/y), polystyrene (145,000 mt/y), styrene (330,000 mt/y), ABS (48,000 mt/y), resins (25,000 mt/y), SB latex (14,000 mt/y).

Nobeoka. Product: nylon 66 (15,000 mt/y).

ASAHI GLASS CO. LTD.

Chiba. Feed: chlorine, natural gas, propylene. Products: ammonia (46,000 mt/y), propylene glycol (14,000 mt/y), propylene oxide (26,000 mt/y).

Kashima. Feed: chlorine, propylene. Products: propylene glycol (26,000 mt/y), propylene oxide (60,000 mt/y).

ASIA OIL CO. LTD.

Yokohama. Feed: heavy reformate. Product: benzene (100,000 mt/y).

CHIBA BUTADIENE INDUSTRY CO. LTD.

Goi-minamikaigan, Chiba. Feed: C_4. Product: butadiene (75,000 mt/y).

CHIBA EDC CO. LTD.

Chiba. Feed: chlorine, ethylene. Product: ethylene dichloride (74,000 mt/y).

CHIBA VCM CO. LTD.

Chiba. Feed: ethylene, ethylene dichloride. Product: vinyl chloride (160,000 mt/y).

CHISSO CORP.

Minamata and Mizushima. Feed: acetic acid, ethylene, vinyl chloride monomer. Products: acetic anhydride (5,200 mt/y), polyvinyl chloride (76,900 mt/y).

CHISSO PETROCHEMICAL CORP.

Goi. Feed: ethylene, propylene. Products: oxoalcohols (50,000 mt/y), hd polyethylene (35,000 mt/y), polypropylene (155,700 mt/y), polyvinyl chloride (50,600 mt/y), solvents (44,000 mt/y), plasticizers (53,000 mt/y).

COSMO MATSUYAMA OIL CO. LTD.

Matsuyama. Feed: naphtha. Products: benzene (10,000 mt/y), toluene (30,000 mt/y), xylene mix (40,000 mt/y), solvents (50,000 mt/y).

DAICEL CHEMICAL INDUSTRIES LTD.

Aboshi. Feed: acetic acid, methanol. Products: acetic acid (225,000 mt/y), acetic anhydride (120,000 mt/y).

Fuji, Shizuoka. Feed: methanol. Product: formaldehyde (190,000 mt/y).

Ohtake, Hiroshima. Feed: acetaldehyde, naphtha, propylene. Products: acetic acid (36,000 mt/y), solvents (50,000 mt/y), plasticizers (10,000 mt/y).

DAINIPPON INK & CHEMICALS INC.

Amagasaki, Chiba, Mikawa, Yokkaichi. Feed: purchased. Products: acrylics (50,000 mt/y), alkyds (42,000 mt/y), butylenes (20,000 mt/y), formaldehyde (100,000 mt/y), polyamide (4,000 mt/y), polyester (70,000 mt/y), polystyrene (84,000 mt/y).

DENKI KAGAKU KOGYO KABUSHIKI KAISHA

Goi, Chiba Prefecture. Feed: acetic acid, benzene, ethylene, vinyl chloride. Products: ABS (55,000 mt/y), ethylbenzene (185,000 mt/y), polystyrene (113,500 mt/y), polyvinyl chloride (65,000 mt/y), styrene (160,000 mt/y).

Ohmi, Niigata Prefecture. Products: polyvinyl alcohol (28,800 mt/y), polyvinyl chloride (24,000 mt/y).

Shibukawa. Product: polyvinyl chloride (26,500 mt/y).

DU PONT-MITSUI POLYCHEMICALS CO. LTD.
(50% E.I. du Pont de Nemours & Co., 50% Mitsui Petrochemical Ind. Ltd.)

Chiba. Feed: ethylene. Product: ld polyethylene (100,000 mt/y).

Ohtake. Feed: ethylene. Product: ld polyethylene (42,000 mt/y).

FUJI OIL CO. LTD.

Sodegaura, Chiba. Feed: naphtha. Product: n-paraffins (8,100 mt/y).

GENERAL PETROCHEMICAL INDUSTRIES LTD.

Osaka. Feed: FCC, reformate. Products: benzene (30,000 mt/y), n-butylene (50,000 mt/y), propylene (65,000 mt/y), TBA (55,000 mt/y), toluene (120,000 mt/y), xylene mix (150,000 mt/y).

IDEMITSU PETROCHEMICAL CO. LTD.

Chiba. Feed: naphtha. Products: benzene (150,000 mt/y), paraxylene (130,000 mt/y), hd polyethylene (82,000 mt/y), polypropylene (80,000 mt/y), polystyrene (30,000 mt/y), styrene (160,000 mt/y).

Tokuyama. Feed: naphtha. Products: benzene (180,000 mt/y), cyclohexane (90,000 mt/y), ethylene (380,000 mt/y), polystyrene (60,000 mt/y), propylene (220,000 mt/y), styrene (91,000 mt/y—joint ownership with Nippon Zeon), toluene (74,000 mt/y), xylene mix (102,000 mt/y).

JAPAN A.G. INTERNATIONAL CHEMICAL CO. LTD.
(subsidiary of Mitsubishi Gas Chemical Co. Ltd.)

Mizushima. Feed: metaxylene. Product: isophthalic acid (35,000 mt/y).

JAPAN ALDEHYDE CO. LTD.

Chiba. Feed: ethylene. Product: acetaldehyde (69,000 mt/y).

JAPAN BUTANOL CO. LTD.

Yokkaichi. Product: butanol (30,000 mt/y).

JAPAN BUTYL CO. LTD.

Kashima. Product: butyl rubber (25,000 mt/y).

Kawasaki. Feed: isobutylene, isoprene. Product: butyl rubber (75,000 mt/y).

JAPAN ETHANOL CO. LTD.

Yokkaichi. Feed: ethylene. Product: ethanol (40,000 mt/y).

JAPAN LACTAM CO. LTD.

Niihama. Feed: cyclohexene, hydroxylamine. Product: caprolactam (72,000 mt/y)

JAPAN PHENOL CO. LTD.

Kashima. Feed: cumene. Products: acetone (80,000 mt/y), phenol (130,000 mt/y).

JAPAN PHTHALIC CO. LTD.
(subsidiary of Mitsubishi Gas Chemical Co. Ltd.)

Mizushima. Feed: orthoxylene. Product: phthalic anhydride (75,000 mt/y).

JAPAN SYNTHETIC ALCOHOL CO. LTD.

Kawasaki. Feed: ethylene. Product: ethanol (40,000 mt/y).

JAPAN SYNTHETIC RUBBER CO. LTD.

Chiba. Feed: butadiene. Products: polybutadiene resins (10,000 mt/y), polybutadiene rubber (50,000 mt/y).

Kashima. Feed: C_4-C_5 streams. Products: butadiene (50,000 mt/y), isoprene (30,000 mt/y), polyisoprene (30,000 mt/y).

Yokkaichi. Feed: acrylonitrile, C_4 stream, ethylene, propylene, styrene. Products: butadiene (95,000 mt/y), ABS-AES-SAN (127,000 mt/y), polybutadiene, S-SBR (25,000 mt/y), EPR (40,000 mt/y), SB latex (72,000 mt/y), SBR, HSR, NBR (255,000 mt/y).

KANEGAFUCHI KAGAKU KK

Kashima. Products: polystyrene (22,800 mt/y), polyvinyl chloride (62,000 mt/y).

Osaka. Product: polyvinyl chloride (22,000 mt/y).

Takasago. Products: polystyrene (28,800 mt/y), polyvinyl chloride (88,000 mt/y), styrene copolymer (41,600 mt/y), vinyl chloride (320,000 mt/y).

KASHIMA VINYL CHLORIDE MONOMER CO. LTD.

Kashima. Feed: ethylene. Product: vinyl chloride (270,000 mt/y).

KAWASAKI KASEI CHEMICALS LTD.

Kawasaki. Feed: crude naphthalene, orthoxylene, oxoalcohols, phthalic anhydride. Products: naphthalene (12,000 mt/y), phthalic anhydride (72,000 mt/y), plasticizers (57,000 mt/y).

KURARAY CO. LTD.

Kashima. Product: polyisoprene (2,500 mt/m).

Okayama. Feed: ethylene. Products: polyvinyl alcohol (225 mt/d).

Nakajo. Feed: ethylene. Product: polyvinyl alcohol (120 mt/d).

KURARAY YUKA CO. LTD.

Yokkaichi City. Feed: paraxylene. Product: terephthalic acid (53,000 mt/y).

KYODO SAKUSAN CO. LTD.
(subsidiary of Daicel Chemical Industries Ltd.)

Aboshi, Himeji, Hyogo. Feed: methanol. Product: acetic acid (225,000 mt/y).

KYOWA YUKA CO. LTD.

Yokkaichi. Feed: ethylene, propylene. Products: acetaldehyde (125,000 mt/y), acetone (36,000 mt/y), butanol (60,000 mt/y), butyraldehyde (180,000 mt/y), oxoalcohols (100,000 mt/y), plasticizers (100,000 mt/y).

MITSUBISHI KASEI CORP.

Kurosaki. Feed: coal, LPG, naphtha. Products: ammonia (264,000 mt/y), caprolactam (84,000 mt/y), carbon black (36,000 mt/y), dimethyl terephthalate (60,000 mt/y), nylons (15,000 mt/y), terephthalic acid (270,000 mt/y), urea (264,000 mt/y).

Mizushima. Feed: naphtha, LPG. Products: acetaldehyde (120,000 mt/y), acetone (55,000 mt/y), acrylonitrile (112,000 mt/y), alphaolefins (25,000 mt/y), benzene (200,000 mt/y), butanol (25,000 mt/y), cyclohexane (100,000 mt/y), maleic anhydride (18,000 mt/y), oxoalcohols (146,000 mt/y), orthoxylene (27,000 mt/y), paraxylene (50,000 mt/y), ld polyethylene (58,000 mt/y), hd polyethylene (69,000 mt/y), polypropylene (35,000 mt/y), propylene (216,000 mt/y), toluene (60,000 mt/y), vinyl chloride (250,000 mt/y), xylene mix (30,000 mt/y).

Yokkaichi. Feed: butadiene, styrene. Products: carbon black (92,000 mt/y), SBR (65,000 mt/y).

MITSUBISHI GAS CHEMICAL CO. INC.

Mizushima. Feed: mixed xylene. Products: ethylbenzene (60,000 mt/y), metaxylene (50,000 mt/y), orthoxylene (70,000 mt/y), paraxylene (120,000 mt/y), xylene mix (300,000 mt/y), plasticizers (65,000 mt/y).

Niigata. Feed: natural gas. Products: ammonia (211,200 mt/y), formaldehyde (220,000 mt/y), methanol (264,000 mt/y), urea (198,000 mt/y).

MITSUBISHI MONSANTO CHEMICAL CO.

Yokkaichi. Feed: acrylonitrile, styrene, SBR. Products: acrylonitrile-styrene (32,000 mt/y), ABS (60,000 mt/y), polystyrene (160,000 mt/y).

MITSUBISHI PETROCHEMICAL CO. LTD.

Kashima. Feed: LPG, naphtha. Products: benzene (221,850 mt/y), cumene (140,000 mt/y), ethylene (387,400 mt/y), ethylene glycol (68,000 mt/y), ethylene oxide (70,000 mt/y), melamine (30,000 mt/y), ld polyethylene (158,900 mt/y), polypropylene (168,000 mt/y), styrene monomer (192,000 mt/y), xylene mix (53,500 mt/y).

Yokkaichi. Feed: LPG, naphtha. Products: acrylic acid-esters (54,000 mt/y), alkylbenzene (65,000 mt/y), benzene (221,850 mt/y), ethylene (254,200 mt/y), ethylene glycol (86,000 mt/y), ethylene oxide (85,000 mt/y), oxoalcohols (30,000 mt/y), ld polyethylene (57,100 mt/y), polypropylene (74,000 mt/y), styrene monomer (261,200 mt/y), toluene (24,000 mt/y), xylene (13,000 mt/y).

MITSUBISHI YUKA BADISCHE CO. LTD.
(joint venture of BASF and Mitsubishi Petrochemical Co. Ltd.)

Yokkaichi. Feed: styrene. Products: expandable polystyrene (49,000 mt/y).

MITSUI PETROCHEMICAL INDUSTRIES LTD.

Chiba. Feed: benzene, ethylene, propylene. Products: acetone (108,000 mt/y), aniline (30,000 mt/y), benzene (93,000 mt/y), butanol (53,000 mt/y), butylenes (22,000 mt/y), ethylene glycol (92,000 mt/y), ethylene oxide (92,000 mt/y), phenol (180,000 mt/y), hd polyethylene (164,100 mt/y), polypropylene (140,000 mt/y), resins (20,000 mt/y), toluene (54,000 mt/y), xylene mix (44,000 mt/y), ethylene-propylene rubber (30,000 mt/y).

Iwakuni-Ohtake. Feed: benzene, ethylene, paraxylene, propylene. Products: acetaldehyde (36,000 mt/y), acetone (36,000 mt/y), benzene (62,000 mt/y), phenol (30,000 mt/y), hd polyethylene (4,200 mt/y), ld polyethylene (45,000 mt/y), lm polyethylene (4,000 mt/y), resins (34,000 mt/y), solvents (9,100 mt/y), terephthalic acid (270,000 mt/y), crude terephthalic acid (320,000 mt/y), toluene (46,000 mt/y), xylene mix (39,000 mt/y)

MITSUI TOATSU CHEMICALS INC.

Shimonoseki. Feed: heavy aromatic oil, coal tar distillate. Product: carbon black (30,000 mt/y).

Yokoshiba. Feed: heavy aromatic oil, coal tar distillate. Product: carbon black (45,000 mt/y).

MIZUSHIMA AROMA CO. LTD.

(subsidiary of Mitsubishi Gas Chemical Co. Ltd.)

Mizushima. Feed: paraxylene. Product: terephthalic acid (150,000 mt/y).

MIZUSHIMA ETHYLENE KK

(50% Mitsubishi Chemical Industries, 50% Sanyo Petrochemicals).

Mizushima. Feed: LPG, naphtha. Products: ethylene (375,000 mt/y), propylene (216,000 mt/y).

NIHON ALKYLATE CO. LTD.

(Sumitomo Chemical Co. and Kao Soap Co.).

Niihama. Feed: benzene. Product: alkylbenzene (30,000 mt/y).

NIHON OXIRANE CO. LTD.

(Atlantic Richfield, Sumitomo Chemical, Showa Denko).

Chiba. Feed: ethylbenzene, propylene. Products: propylene oxide (123,000 mt/y), styrene (270,000 mt/y).

NIHON POLYSTYRENE CO. LTD.

Kawasaki. Feed: styrene. Product: polystyrene (58,000 mt/y).

NIPPON CARBIDE INDUSTRIES CI

Toyama. Feed: acrylic acid-esters, formaldehyde, melamine, styrene, vinyl acetate-chloride. Product: acrylics, polyvinyl chloride.

NIPPON KASEI CHEMICAL CO. LTD.

Onahama, Fukushima. Feed: creosote oil, methanol. Products: carbon black (28,000 mt/y), formaldehyde (96,000 mt/y).

NIPPON MINING CO. LTD.

Mizushima. Feed: reformate. Products: n-paraffins (80,000 mt/y), propylene (80,000 mt/y), xylene mix (70,000 mt/y).

Nagoya. Feed: reformate. Products: benzene (112,000 mt/y), cyclohexane (80,000 mt/y), paraxylene (100,000 mt/y), propylene (20,000 mt/y), toluene (120,000 mt/y), xylene mix (123,000 mt/y).

NIPPON OIL AND FATS CO.

Oita. Feed: C_4 cut, C_4 LPG. Products: maleic anhydride (12,000 mt/y), polybutylene (9,000 mt/y).

NIPPON PETROCHEMICALS CO. LTD.

Kawasaki and Ukishima. Feed: LPG, naphtha. Products: benzene (72,000 mt/y), butadiene (60,000 mt/y), isopropanol (60,000 mt/y), n-paraffins (75,000 mt/y), ld polyethylene (95,000 mt/y), toluene (42,000 mt/y), xylene (34,000 mt/y).

NIPPON PETROLEUM DETERGENT CO. LTD.

(50% Nippon Petrochemicals Co., 50% Chevron Chemical Co.)

Kawasaki. Feed: benzene, n-paraffin, propylene. Product: alkylbenzene (90,000 t/y).

NIPPON POLYURETHANE INDUSTRIAL CO. LTD.

Shin-Nanyo, Yamaguchi. Product: polyester (7,200 t/y).

NIPPON SHOKUBAI KAGAKU KOGYO CO. LTD.

Himeji. Feed: benzene, naphthalene, orthoxylene, propylene. Products: acrylic acid-acrylic esters (80,000 mt/y), maleic anhydride (36,000 mt/y), phthalic anhydride (80,000 mt/y).

Kawasaki. Feed: ethylene. Products: ethylene glycol (185,000 mt/y), ethylene oxide (185,000 mt/y).

Suita. Feed: ethylene glycols, phthalic anhydride, styrene. Product: alkyds, polyester (48,000 mt/y).

NIPPON ZEON CO. LTD.

Kawasaki. Feed: acrylonitrile, butadiene, styrene. Products: NBR (30,000 mt/y), SBR (30,000 mt/y).

Mizushima. Feed: vinyl chloride. Product: polyvinyl chloride (130,000 mt/y).

Takaoka. Feed: vinyl chloride. Product: polyvinyl chloride (80,000 mt/y).

Tokuyama. Feed: C_4 stream. Products: butadiene (140,000 mt/y), polybutylene (48,000 mt/y), EBR (10,000 mt/y), SBR-NBR-HS (190,000 mt/y)

NISSAN CHEMICAL INDUSTRIES LTD.

Toyama. Feed: LPG, naphtha. Products: ammonia (113,000 mt/y), melamine (42,000 mt/y), urea (127,000 mt/y).

NISSAN MARUZEN POLYETHYLENE CO. LTD.

Goi, Chiba. Feed: ethylene. Product: hd polyethylene (70,000 mt/y).

NISSAN NALKEN CORP.

Chiba, Pref. Feed: benzene, n-paraffin. Product: alkylbenzene (40,000 mt/y).

NISSAN PETROCHEMICAL LTD.

Goi, Chiba. Feed: ethylene, olefins, propylene. Products: oxoalcohols (80,000 mt/y), polyvinyl chloride (55,000 mt/y), vinyl chloride (60,000 mt/y).

NISSO MARUZEN CHEMICAL CO. LTD.

Goi, Ichihara. Feed: ethylene, propylene oxide. Products: ethylene glycol (70,000 mt/y), ethylene oxide (70,000 mt/y), propylene glycol (22,000 mt/y).

NISSO PETROCHEMICAL INDUSTRIES CO. LTD.

Yokkaichi. Feed: ethylene. Products: ethylene glycol (60,000 mt/y), ethylene oxide (60,000 mt/y).

OKAYAMA BUTADIENE CO. LTD.

(Joint venture of Nippon Zeon Co. Ltd. and Asahi Chemical Industry Co. Ltd.)

Mizushima. Feed: C_4 stream. Product: butadiene (140,000 mt/y).

OSAKA GAS CO. LTD.

Osaka. Feed: coke oven gas oil. Products: benzene (56,000 mt/y), naphthalene (11,000 mt/y), toluene (5,000 mt/y).

OSAKA PETROCHEMICAL INDUSTRIES LTD.

Takaishi City, Osaka. Feed: LPG, naphtha. Products: aromatics (225,000 mt/y),benzene (100,000 mt/y), ethylene (330,000 mt/y), propylene (220,000 mt/y), toluene (65,000 m/ty), xylene mix (60,000 mt/y).

SANYO ETHYLENE CO. LTD.

Mizushima. Feed: naphtha. Products: ethylene (390,000 mt/y), propylene (254,000 mt/y).

SANYO MONOMER CO. LTD.

(joint venture of Nippon Zeon Co. Ltd., Asahi Chemical Co., Chisso Corp.)

Mizushima. Feed: ethylene, chlorine. Products: vinyl chloride (175,000 mt/y).

SEITETSU KAGAKU CO. LTD.

Befu. Products: formaldehyde (32,400 mt/y).

Himeji. Products: formaldehyde (107,000 mt/y), methanol (165,000 mt/y).

SENBOKU POLYMER CO. LTD.

(50% Mitsui Toatsu, 35% Nippon Petrochemicals, 15% Asahi Chemicals).

Osaka. Product: polypropylene (80,000 mt/y).

SHIN-DAIKYOWA PETROCHEMICAL CO. LTD.

(Daikyo Oil Co. Ltd., Tosoh Corp., Kyowa Hakko Kogyo Co. Ltd., Dainippon Ink and Chemicals Inc., Industrial Bank of Japan).

Yokkaichi. Feed: naphtha. Products: aromatics (124,000 mt/y), benzene (90,000 mt/y), butadiene (44,000 mt/y), cumene (140,000 mt/y), ethylene (300,000 mt/y), ethylbenzene (130,000 mt/y), propylene (160,000 mt/y), styrene (91,000 mt/y), toluene (60,000 mt/y), xylene mix (50,000 mt/y).

SHIN-ETSU CHEMICAL CO. LTD.

Kashima. Feed: vinyl chloride. Product: polyvinyl chloride (198,000 mt/y).

Shin-Nanyo. Feed: vinyl chloride. Product: polyvinyl chloride (42,000 mt/y).

SHIN-ETSU VINYL ACETATES CO. LTD.

Sakai. Feed: acetic acid, ethylene. Product: vinyl acetate (80,000 mt/y).

SHOWA ACETYL CHEMICAL CO. LTD.

Ohita. Feed: ethylene. Products: acetaldehyde (100,000 mt/y), acetic acid (130,000 mt/y), vinyl acetate (80,000 mt/y).

SHOWA DENKO KK

Kawasaki. Feed: propylene. Products: acrylonitrile (51,200 mt/y), ammonia (197,200 mt/y), propylene (31,000 mt/y).

Ohita. Feed: naphtha. Products: acetaldehyde (100,000 mt/y), acetic acid (130,000 mt/y), butadiene (45,000 mt/y), ethylene (320,000 mt/y), hd polyethylene (112,700 mt/y), ld polyethylene (70,000 mt/y), polypropylene (91,600 mt/y), propylene (170,000 mt/y).

SHUNAN CHEMICAL CO. LTD.

Tokuyama City. Products: ethylene dichloride (130,000 mt/y), propylene oxide (40,000 mt/y).

SUMITOMO CHEMICAL CO. LTD.

Chiba. Feed: butane, LPG, naphtha. Products: benzene (100,000 mt/y), ethylene (357,500 mt/y), polyethylene (182,800 mt/y), polyisoprene (170,000), propylene (144,000 mt/y), polyvinyl chloride (49,800 mt/y), propylene (255,100 mt/y), toluene (60,000 mt/y), xylene (40,000 mt/y), SBR (50,200 mt/y), ethylene-propylene rubber (35,000 mt/y).

Niihama. Feed: butane, naphtha. Products: acrylic acid-esters (40,000 mt/y), acrylonitrile (52,000 mt/y), polyvinyl chloride (19,300 mt/y).

SUN ARROW CHEMICAL CO. LTD.

(Tokuyama Soda Co. Ltd.)

Tokuyama. Feed: ethylene dichloride. Products: polyvinyl chloride (85,000 mt/y), vinyl chloride (180,000 mt/y).

TAKEDA CHEMICAL INDUSTRIES LTD.

Kashima. Feed: benzene. Product: maleic anhydride (16,500 t/y).

Shimizu. Feed: butadiene, styrene maleic anhydride, propylene glycol. Products: polyester (27,500 mt/y), SBR (20,000 mt/y).

TEIJIN HERCULES CHEMICAL CO. LTD.

Ehime. Feed: paraxylene. Product: dimethyl terephthalate (140,000 mt/y).

Matsuyama. Feed: paraxylene. Product: dimethyl terephthalate (60,000 mt/y)..

Tokuyama. Feed: paraxylene. Product: dimethyl terephthalate (75,000 mt/y).

TEIJIN PETROCHEMICAL INDUSTRIES LTD.

Ehime. Feed: mixed xylenes. Products: orthoxylene (30,000 mt/y), paraxylene (170,000 mt/y).

Tokuyama. Feed: mixed xylene. Products: ethylbenzene (20,000 mt/y), orthoxylene (30,000 mt/y), paraxylene (35,000 mt/y).

TOBU BUTADIENE CO. LTD.

(50% Japan Synthetic Rubber, 50% Sumitomo Chemical)

Chiba. C_4 stream. Product: butadiene (80,000 mt/y).

TOHO RIKA KOGYO KK

Minato, Nagoya. Feed: methanol, orthoxylene. Product: formaldehyde (80,000 mt/y), phthalic anhydride (30,000 mt/y).

TOKUYAMA PETROCHEMICAL CO. LTD.
Shin-Nanyo. Feed: ethylene. Products: acetaldehyde (100,000 mt/y), acetic acid (60,000 mt/y).

TOKUYAMA SODA CO. LTD.
Tokuyama. Feed: propylene. Products: ethylene dichloride (132,000 mt/y), isopropanol (36,000 mt/y), polypropylene (95,000 mt/y), propylene oxide (36,000 mt/y).

TOKUYAMA STYRENE MONOMER CO. LTD.
(jointly owned by Idemitsu Petrochemical Co. Ltd., and Nippon Zeon Co. Ltd.)
Tokuyama. Feed: benzene, ethylene. Product: styrene (91,000 mt/y).

TOMAKOMAI SODA CO. LTD.
(Nippon Zeon, Hokkaido Soda, Maruzen Petrochemical, Nippon Light Metal, Nissho Iwai, Asahi Denka)
Tomakomai. Feed: ethylene. Product: ethylene dichloride (120,000 mt/y).

TONEN PETROCHEMICAL CO. LTD.
Kawasaki. Feed: naphtha, LPG. Products: butadiene (105,000 mt/y), butanol (7,700 mt/y), ethylene (350,000 mt/y), hd polyethylene (36,800), propylene (224,000 mt/y), polypropylene (76,000 mt/y).
Wakayama. Feed: reformate. Products: benzene (40,000 mt/y), orthoxylene (65,000 mt/y), paraxylene (90,000 mt/y), toluene (80,000 mt/y).

TORAY INDUSTRIES INC.
Chiba. Feed: acrylonitrile, butadiene, styrene. Product: ABS (55,000 mt/y).
Kawasaki. Feed: benzene, toluene, xylene mix. Products: benzene (85,000 mt/y), cyclohexane (150,000 mt/y), orthoxylene (100,000 mt/y), paraxylene (200,000 mt/y), xylene mix (39,000 mt/y).
Nagoya. Feed: cyclohexane, paraxylene. Products: caprolactam (130,000 mt/y), nylon (26,400 mt/y), terephthalic acid (100,000 mt/y).

TOSOH CORP.
Shin-Nanyo, Yamaguchi. Yokkaichi, Mie. Products: ld polyethylene (167,000 mt/y), hd polyethylene (72,000 mt/y), polyvinyl chloride (150,000 mt/y), vinyl chloride (299,000 mt/y).

TOYO CONTINENTAL CARBON LTD.
(subsidiary of Witco Corp.)
Shimonoseki. Feed: heavy aromatic oils. Product: carbon black (15,000 mt/y).
Yokoshiba. Feed: heavy aromatic oils. Product: carbon black (45,000 mt/y).

UBE INDUSTRIES LTD.
Ichihara, Chiba. Feed: butadiene, ethylene. Products: polybutadiene (60,000 mt/y), ld polyethylene (147,000 mt/y).
Sakai, Osaka. Feed: benzene, LPG, LNG, naphtha, propylene. Products: ammonia (234,600 mt/y), caprolactam (90,000 mt/y), cyclohexane (100,000 mt/y), polypropylene (105,000 mt/y), urea (95,200 mt/y).
Ube, Yamaguchi. Feed: benzene. Products: caprolactam (90,000 mt/y), cyclohexane (58,000 mt/y), nylon 6 (24,600 mt/y), nylon 66 (2,400 mt/y), nylon 12 (2,400 mt/y).

UKISHIMA AROMATIC CHEMICALS CO. LTD.
(100% Nippon Petrochemicals Co. Ltd.)
Ukishima. Feed: benzene, C_8s, reformate. Products: cyclohexane (150,000 mt/y), orthoxylene (100,000 mt/y), paraxylene (200,000 mt/y)

UKISHIMA PETROCHEMICALS CO. LTD.
(50% Nippon Petrochemicals Co. Ltd., 50% Mitsui Petrochemical Industries)
Ukishima. Feed: LPG, naphtha. Products: ethylene (312,000 mt/y), propylene (172,000 mt/y).

UNITIKA CHEMICAL CO.
Sakai. Feed: vinyl chloride. Product: polyvinyl alcohol (24,000 mt/y).

YUKA MELAMINE CO. LTD.
Kashima. Feed: urea. Product: melamine (30,000 mt/y).

ZEON ISOPRENE CO. LTD.
(Subsidiary of Nippon Zeon)
Mizushima. Feed: C_5 stream, isoprene. Products: isoprene (45,000 mt/y), polyisoprene (37,000 mt/y), C_5 resin.

JORDAN

INTERMEDIATES PETROCHEMICALS INDUSTRIES CO. LTD.
Zarqa. Feed: glycols, maleic-phthalic anhydrides, oxoalcohols, polyvinyl chloride, styrene. Products: polyesters (8,000 mt/y), plasticizers (4,000 mt/y).

KOREA

DAELIM INDUSTRIAL CO. LTD.
Yeo-Chon, Chun-Nam. Feed: naphtha. Products: aromatics (148,000 mt/y), benzene (74,000 mt/y), ethylene (350,000 mt/y), propylene (187,000 mt/y), styrene (100,000 mt/y), toluene (44,000 mt/y), xylene mix (30,000 mt/y).

DAINONG PETROCHEMICAL INDUSTRY CO. LTD.
(joint venture Dainong Co. Ltd., Mitsui Toatsu Chemicals Inc., Toyo Menka Kaisha Ltd.)
Ulsan. Feed: benzene. Product: maleic anydride (12,000 mt/y).

HAN YANG CHEMICAL CORP.
Yeochun, Jinhae, Ulsan. Feed: ethylene. Products: ethylene dichloride (286,000 mt/y), plasticizers (26,000 mt/y), polyethylene (303,000 mt/y), polyvinyl chloride (250,000 mt/y), vinyl chloride (210,000 mt/y).

HANKOOK CAPROLACTAM CORP.
Ulsan. Feed: cyclohexane. Product: caprolactam (40,000 mt/y).

HANNAM CHEMICAL CORP.
Ulsan. Feed: acrylonitrile, butadiene, propylene oxide, styrene. Product: ABS (40,000 mt/y), polystyrene (180,000 mt/y), propylene glycol (20,000 mt/y), SAN (20,000 mt/y).

HONAM ETHYLENE CO. LTD.
Yeo-Cho. Products: benzene (74,000 mt/y), butadiene (129,000 mt/y), ethylene (350,000 mt/y), propylene (187,000 mt/y), toluene (44,000 mt/y), xylene mix (30,000 mt/y).

ISU CHEMICAL CO. LTD.
Ulsan. Feed: benzene, n-paraffin, n-olefin, propylene tet. Product: alkylbenzene (100,000 mt/y).

KOHAP CHEMICAL CORP.
Ulsan. Feed: virgin xylene. Products: benzene (30,000 mt/y), orthoxylene (30,000 mt/y), paraxylene (160,000 mt/y).

KOREA FERTILIZER CO. LTD.
Ulsan. Feed: naphtha. Products: ammonia (195,000 mt/y), melamine (18,000 mt/y), urea (330,000 mt/y).

KOREA KUMHO PETROCHEMICAL CO. LTD.
Ulsan and Yeochun. Feed: C_4, butadiene, styrene. Products: butadiene (70,000 mt/y), polybutadiene (35,000 mt/y), SBR (130,000 mt/y).

KOREA PETROCHEMICAL INDUSTRIES CO. LTD.
Ulsan. Feed: ethylene, propylene. Products: hd polyethylene (70,000 mt/y), polypropylene (120,000 mt/y).

KOREA POLYOL CO. LTD.
Ulsan. Feed: ethylene oxide, propylene oxide. Products: polyester polyol (50,000 mt/y), ethoxylates (5,000 mt/y), polyethylene glycol (5,000 mt/y).

KUMHO SHELL CHEMICAL CO.
(Shell 50%, KKPC 50%)
Yeochon. Products: acetone (15,000 mt/y), cumeme (40,000 mt/y), epoxy resins, DPP, phenol (25,000 mt/y).

LUCKY ADVANCED MATERIAL INC.
(Licensee of Witco Corp.—Concarb Div.)
Bupyong. Feed: heavy aromatic oil, coal tar distillate. Product: carbon black (30,000 mt/y).
Yosu. Feed: heavy aromatic oil, coal tar distillate. Product: carbon black (105,000 mt/y).

LUCKY LTD.
Na-Ju and Yeochun. Products: ABS (135,000 mt/y), acrylics (7,000 mt/y), acrylic acid-esters (58,000 mt/y), butanol (17,000 mt/y), oxoalcohols (55,000 mt/y), polystyrene (50,000 mt/y), polyvinyl chloride (280,000 mt/y).

NAMHAE CHEMICAL CORP.
Yo-Chun City, Chunnam. Feed: naphtha. Products: ammonia (630,000 mt/y), urea (700,000 mt/y).

SAMKYUNG CHEMICAL CO. LTD.
Ulsan. Feed: butanol, orthoxylene, phthalic anhydride, 2-ethyl hexanol. Product: maleic anhydride (3,000 mt/y), phthalic anhydride (70,000 mt/y), plasticizers (70,000 mt/y).

TONG SUH PETROCHEMICAL CORP. LTD.
Ulsan. Feed: ammonia, propylene. Product: acrylonitrile (83,000 mt/y).

YONG-NAM CHEMICAL CO. LTD.
Ulsan. Feed: naphtha. Product: ammonia (310 mt/d), urea (375 mt/d).

YUKONG LTD.
Ulsan. Feed: naphtha. Products: aromatics (70,000 mt/y), benzene (194,000 mt/y), butadiene (24,000 mt/y), cyclohexane (40,000 mt/y), ethylene (155,000 mt/y), fuel oils (18,000 mt/y), propylene (81,000 mt/y), pyrolysis gasoline (128,000 mt/y), toluene (270,000 mt/y), xylene mix (297,000 mt/y).

KUWAIT

PETROCHEMICAL INDUSTRIES CO.
Shuaiba. Feed: natural gas. Products: ammonia (3,000 mt/d), urea (2,500 mt/d).

LIBYA

Ras Lanuf. Product: ethylene (350,000 mt/y).

MADAGASCAR

N-REN CORP.
Tamatave. Feed: naphtha. Product: ammonia (175 mt/d).

ZE-REN
Tamatave. Product: urea (90,000 mt/y).

MALAYSIA

BORDEN CHEMICAL
Prai. Feed: methanol, phenol, urea. Product: formaldehyde (19,000 mt/y).

MALAYSIAN CARBON SDN. BHD.
(Subsidiary of Cabot Corp.)
Port Dickson. Feed: heavy aromatic oil. Product: carbon black.

MEXICO

CELANESE MEXICANA SA
Cangrejera. Products: acetic acid (119,000 mt/y), acetic anhydride (45,000 mt/y), acetone (60,000 mt/y), amines (9,500 mt/y), butanol (16,000 mt/y), butyraldehyde (90,000 mt/y), DMF (7,500 mt/y), vinyl acetate (31,000 mt/y).
Celaya. Products: acetic acid (63,000 mt/y), acetic anhydride (45,000 mt/y), acetone (14,000 mt/y), butanol-n (38,000 mt/y), 2-ethyl hexanol (70,000 mt/y), MEK & esters (30,000 mt/y), mesityl oxide (22,000 mt/y), vinyl acetate (30,000 mt/y).
Cosoleacaque. Product: acrylic acid-esters (28,500 mt/y).
Lerma. Products: phthalic anhydride (23,500 mt/y), plasticizers (22,500 mt/y).

Ocotlan. Products: polyamide (16,860 mt/y), polyester (9,900 mt/y).

Queretaro. Products: polyamide (7,000 mt/y), polyester (94,000 mt/y).

Toluca. Products: polyamide (12,000 mt/y), polyester (23,600 mt/y).

Zacapu. Product: polypropylene (4,200 mt/y).

DERIVADOS MALEICOS SA DE CV

Puebla. Feed: benzene. Product: maleic anhydride (7,000 mt/y).

FENOQUIMIA SA

(75% Industrias Resistol, 25% Promociones Industriales Banamex)

Cosoleacaque, Ver. Feed: cumene, cyanhidric acid, methanol. Products: acetone (23,000 mt/y), acrylics (16,500 mt/y), phenol (38,000 mt/y).

FERTILIZANTES MEXICANOS SA

Camargo. Feed: ammonia, CO_2. Product: urea (75,000 mt/y).

Coatzacoalcos (Pajaritos). Feed: ammonia, carbon dioxide. Product: urea (990,000 mt/y)

Minatitlan. Feed: ammonia, carbon dioxide. Product: urea (302,000 mt/y).

Salamanca. Feed: ammonia, carbon dioxide. Product: urea (386,000 mt/y).

GLICOLES MEXICANOS SA DE CV

Apizaco, Tlaxcala. Feed: ethylene oxide. Product: ethylene glycol (100,000 mt/y).

HULES MEXICANOS SA

(owned by Pemex and Polysar Ltd.)

Altamira, Tam. Feed: styrene, butadiene, acn. Product: SBR (45,000 mt/y).

INDUSTRIAS DERIVADAS DEL ETILENO SA

Puebla, Pue. Feed: ethylene oxide, propylene oxide. Product: ethanolamines (7,200 mt/y), ethylene glycol (30,000 mt/y), propylene glycol (10,000 mt/y).

INDUSTRIAS RESISTOL SA

Coatzacoalcos. Feed: styrene. Product: polystyrene (41,000 mt/y).

Lecheria. Feed: acrylonitrile, butadiene, styrene. Products: ABS (13,300 mt/y), SBR (4,500 mt/y).

Lerma. Feed: butadiene, methanol, styrene monomer. Products: formaldehyde (28,500 mt/y), SBR (16,500 mt/y).

Xicohtzingo. Feed: styrene. Product: polystyrene (26,000 mt/y).

NEGROMEX SA

Salamanca. Feed: aromatic oils, butadiene, styrene. Products: carbon black (49,600 mt/y), rubber (70,000 mt/y).

PETROCEL SA

Altamira, Tamps. Feed: methanol, paraxylene. Products: dimethyl terephthalate (270,000 mt/y), terephthalic acid (55,000 mt/y).

PETROLEOS MEXICANOS

Azcapotzalco. Feed: benzene, propylene tet, refinery gas. Products: alkylbenzene (36,500 mt/y), propylene (27,000 mt/y), propylene tet (17,500 mt/y).

Cadereyta, N.L. Feed: refinery gas. Product: propylene (45,000 mt/y).

Camargo, Chihuahua. Feed: natural gas. Products: ammonia (132,000 mt/y).

Ciudad Madero, Tamaulipas. Feed: benzene, butylenes, ethylene, refinery gas. Products: alkylbenzene (31,600 mt/y), butadiene (55,000 mt/y), ethylbenzene (39,400 mt/y), propylene (61,000 mt/y), propylene tet (19,000 mt/y), styrene (30,000 mt/y).

Cosoleacaque, Veracruz. Feed: natural gas, propylene. Products: acrylonitrile (24,000 mt/y), ammonia (2,380,000 mt/y), paraxylene (40,000 mt/y).

La Cangrejera, Veracruz. Feed: benzene, ethylene, naphtha, propylene. Product: acetaldehyde (100,000 mt/y), aromatics mix (22,000 mt/y), benzene (275,000 mt/y), cumene (40,000 mt/y), ethylbenzene (187,500 mt/y), ethylene (500,000 mt/y), ethylene oxide (100,000 mt/y), orthoxylene (55,000 mt/y), paraxylene (240,000 mt/y), ld polyethylene (240,000 mt/y), propylene (26,900 mt/y), styrene (150,000 mt/y), toluene (365,000 mt/y), xylene mix (360,000 mt/y).

Minatitlan, Veracruz. Feed: benzene, ethylene, naphtha, refinery gas. Products: aromatics mix (44,000 mt/y), benzene (124,250 mt/y), cyclohexane (106,000 mt/y), ethylbenzene (17,550 mt/y), orthoxylene (11,250 mt/y), propylene (53,000 mt/y), toluene (100,000 mt/y), xylene mix (40,610 mt/y).

Morelos, Veracruz. Feed: ethylene. Product: ethylene oxide (200,000 mt/y).

Pajaritos, Veracruz. Feed: ethylchloride, ethylene. Products: acetaldehyde (44,000 mt/y), ethylene (209,210 mt/y), ethylchloride (414,050 mt/y), ethylene oxide (28,000 mt/y), vinyl chloride (30,000 mt/y).

Poza Rica, Veracruz. Feed: ethylene. Products: ethylene (182,000 mt/y), ld polyethylene (51,000 mt/y), hd polyethylene (100,000 mt/y).

Reynosa, Tamaulipas. Feed: ethylene. Products: ethylene (27,210 mt/y), ld polyethylene (18,000 mt/y).

Salamanca, Guanajuato. Feed: natural gas, propylene. Products: ammonia (379,000 mt/y), isopropanol (15,000 mt/y), propylene (48,000 mt/y).

Salina Cruz, Oax. Feed: refinery gas. Product: propylene (45,000 mt/y).

San Martin, Texmelucan, Puebla. Feed: benzene, natural gas, propylene tet. Products: alkylbenzene (70,000 mt/y), methanol (171,500 mt/y), propylene tet (80,000 mt/y).

Tula, Hidalgo. Feed: ammonia, natural gas, propylene. Products: acrylonitrile (50,000 mt/y), propylene (45,000 mt/y).

POLICYD SA de CV

Mexico City and Tampico. Feed: vinyl chloride monomer. Product: polyvinyl chloride (135,000 mt/y).

POLIMEROS DE MEXICO SA

Moyotzingo, Puebla. Feed: vinyl chloride. Product: polyvinyl chloride (30,000 mt/y).

Xicohtzingo. Feed: vinyl chloride. Product: polyvinyl chloride (30,000 mt/y).

POLIOLES SA DE CV

(60% Mexican shareholders, 40% BASF de Mexico)

Lerma (State of Mexico). Feed: ethylene oxide, propylene oxide. Products: ethylene glycol, propylene oxide.

POLIESTIRENO Y DERIVADOS SA de CV

Apizaco, Tlaxcala. Feed: styrene: Product: polystyrene (50,000 mt/y).

POLIVIN SA DE CV

Celaya, Guanajuato. Feed: methanol, vinyl acetate. Product: polyvinyl alcohol (2,400 mt/y).

SÍNTESIS ORGÁNICAS SA

Apizaco, Tlaxcala. Feed: orthoxylene. Product: phthalic anhydride (30,000 mt/y).

Puebla, Pue. Feed: orthoxylene, 2-ethyl hexanol. Products: phthalic anhydride (12,000 mt/y), plasticizers (15,000 mt/y).

UNIVEX SA

(DSM affiliate)

Salamanca, Gto. Product: caprolactam (50,000 mt/y).

MOROCCO

SNEP—Societe Nationale d'Electrolyse et de Petrochemie.

Mohammedia. Products: polyvinyl chloride (25,000 mt/y), vinyl acetate (25,000 mt/y).

NETHERLANDS

AKZO ZOUT CHEMIE NEDERLAND BV

Botlek. Feed: ethylene, chlorine, HCl. Product: vinyl chloride (500,000 mt/y).

AMMONIAK UNIE

(Kemira/BASF)

Pernis. Feed: natural gas. Product: ammonia (380,000 mt/y).

ARCO CHEMIE NEDERLAND LTD.

(100% Arco Chemical Co.)

Rotterdam. Feed: isobutane and propylene. Product: butanol (587,755 mt/y), isobutylene (299,319 mt/y), MTBE (9,400 b/d), propylene glycol (59,863 mt/y), propylene oxide (244,897 mt/y).

BREDASE POLYSTYREEN MBV.

Breda. Feed: styrene. Product: polystyrene (150,000 mt/y).

CINDU CHEMICALS BV

Uithoorn (near Amsterdam). Feed: coal tar. Products: carbon black feedstock (10,000 mt/y), naphthalene (10,000 mt/y).

DEGUSSA.

Botlek. Feed: aromatic hydrocarbons, coal tar oil. Product: carbon black.

DOW CHEMICAL EUROPE

Terneuzen. Products: benzene, butadiene, cumene, ethylene, ethylbenzene, ethylene glycol, ethylene oxide, ld-lld polyethylene, polystyrene, propylene, SB-latex, styrene.

DSM

Chemical Products Division

South Limburg. Products: acetylene (2,200 mt/y), acrylonitrile (180,000 mt/y), caprolactam (230,000 mt/y), melamine (60,000 mt/y).

Chemische Industrie Rijnmond

Botlek. Feed: toluene. Product: phenol (160,000 mt/y).

Methanol Chemie Nederland VoF

Delfzijl and Rotterdam. Products: formaldehyde (120,000 mt/y), resins (200,000 mt/y).

Methanor VoF.

Delfzijl. Product: methanol (740,000 mt/y).

Polymer Division

South Limburg. Feed: C_4, C_5, naphtha, gas oil. Products: benzene (200,000 mt/y), butadiene (110,000 mt/y), EPDM rubber (60,000 mt/y), ethylene (850,000 mt/y), MTBE (40,000 mt/y), ld polyethylene (370,000 mt/y), hd polyethylene (220,000 mt/y), polypropylene (140,000 mt/y), polyvinyl chloride (195,000 mt/y), propylene (470,000 mt/y), ABS (50,000 mt/y).

DSM AGRO BV

Geleen. Feed: natural gas. Products: ammonia (800,000 mt/y), urea (480,000 mt/y).

IJmuiden. Feed: natural gas. Product: ammonia (290,000 mt/y).

Rotterdam. Feed: natural gas. Product: ammonia (150,000 mt/y DSM—150,000 mt/y BASF).

HOECHST HOLLAND NV

Vlissingen. Feed: p-xylene, methanol. Product: dimethyl terephthalate (90,000 mt/y).

ICI HOLLAND BV

Rozenburg. Product: polypropylene (120,000 mt/y).

KEMIRA BV

(subsidiary of Kemira Oy)

Rozenburg. Feed: natural gas. Products: ammonia (550,000 mt/y), urea (210,000 mt/y).

NEDERLANDSE STIKSTOF MAATSCHAPPIJ BV

Sluiskil. Feed: natural gas. Products: ammonia (1,500,000 mt/y), urea (780,000 mt/y).

SHELL NEDERLAND CHEMIE BV

Moerdijk. Feed: gas oil, LPG, naphtha. Products: butadiene (115,000 mt/y), ethylbenzene (350,000 mt/y), ethylene (550,000 mt/y), ethylene glycol (160,000 mt/y), ethylene oxide (185,000 mt/y), propylene (300,000 mt/y), propylene oxide (125,000 mt/y), styrene (320,000 mt/y).

Pernis. Feed: naphtha. Products: acetone (150,000 mt/y), bisphenol A (90,000 mt/y), BR-latex (20,000 mt/y), ethylene glycol (55,000 mt/y), isopropanol (290,000 mt/y), MEK (60,000 mt/y), methyl isobutyl ketone (30,000 mt/y), isoprene rubber (40,000 mt/y), MTBE (125,000 mt/y), polyether polyols (80,000 mt/y), polypropylene (90,000 mt/y), polyvinyl chloride (200,000 mt/y), propylene (90,000 mt/y), SBR (120,000 mt/y).

UCAM VOF
(2/3 DSM, 1/3 Kemira)
Geleen. Feed: natural gas. Product: ammonia (460,000 mt/y).

NEW ZEALAND

PETRALGAS CHEMICALS NZ LTD.
Waitara. Feed: natural gas. Product: methanol (1,450 mt/d).

PETROCHEMICAL CORP. OF NZ LTD.
Kapuni. Feed: natural gas. Products: ammonia (290 mt/d), urea (500 mt/d).

NICARAGUA

QUÍMICA BORDEN CASA
Tipitapa. Feed: methanol. Product: formaldehyde (6,000 mt/y).

NIGERIA

NIGERIAN NATIONAL PETROLEUM CORP.
Ekpan and Kaduna. Feed: FCC decant oil, benzene, ethylene, kerosine, refinery off gas. Products: alkylbenzene (30,000 mt/y), benzene (15,000 mt/y), carbon black (18,000 mt/y), polypropylene (35,000 mt/y).

NORWAY

I/S NORETYL
(51% Norsk Hydro, 49% Statoil)
Rafnes, Bamble. Feed: natural gas liquids. Products: ethylene (390,000 mt/y), propylene (70,000 mt/y).

NORSK HYDRO AS
Porsgrunn. Feed: vinyl chloride. Product: polyvinyl chloride (90,000 mt/y).
Rafnes, Bamble. Feed: chlorine, ethylene. Product: vinyl chloride (420,000 mt/y).

NORSK HYDRO NORWAY
Porsgrunn. Feed: natural gas liquids. Product: ammonia (420,000 mt/y).

NORSK KOKSVERK AS
Mo-i-Rana. Feed: coke oven gas. Products: ammonia (40,000 mt/y), benzene (5,000 mt/y), crude tar (16,000 mt/y).

PAKISTAN

DAWOOD HERCULES CHEMICALS LTD.
Chichoki Mallian. Feed: natural gas. Products: ammonia (210,000 mt/y), urea (345,000 mt/y).

EXXON CHEMICAL PAKISTAN LTD.
Daharki, Dist. Sukkur. Feed: natural gas. Products: ammonia (155,600 mt/y), urea (267,000 mt/y).

PERU

FERTILIZANTES SINTETICOS SA
Lima. Feed: residual oil. Product: ammonia (75 mt/d).

PETROPERU
(Licensee of Witco Corp.—Concarb Div.)
Negro de Humo plant, Talara. Feed: heavy aromatic oil. Product: carbon black (15,000 mt/y).

PETROPERU
Talara. Feed: ammonia-carbon dioxide, FCC bottoms, isopropanol, propylene. Products: acetone (5,600 mt/y), carbon black (7,750 mt/y), isopropanol (11,400 mt/y), urea (510 mt/d).

PHILIPPINES

COLUMBIAN CARBON PHILIPPINES INC.
Bataan. Feed: heavy aromatic hydrocarbons. Product: furnace carbon black (16,000 mt/y).

LMG CHEMICALS INC.
San Pascual, Batangas. Feed: benzene, dodecene. Product: alkylbenzene (22,000 mt/y).

PORTUGAL

COMPANHIA INDUSTRIAL DE RESINAS SINTETICAS (CIRES)
Estarreja. Feed: vinyl chloride. Product: polyvinyl chloride (70,000 mt/y).

COMPANHIA NACIONAL DE PETROQUÍMICA EP
Sines. Feed: naphtha. Products: butadiene (40,000 mt/y), ethylene (300,000 mt/y), propylene (150,000 mt/y).

EPSI—Empresa de Polímeros de Sines
(86% Portuguese State, 13.2% Cdf Chimie)
Sines. Feed: ethylene, propylene. Products: polyethylene (180,000 mt/y), polypropylene (50,000 mt/y).

PETROGAL
Leça da Palmeira. Feed: reformate. Products: benzene (44,000 mt/y), orthoxylene (40,000 m/ty), paraxylene (90,000 mt/y), toluene (140,000 mt/y), xylene mix (10,000 mt/y).

PETROQUÍMICA E GÁS DE PORTUGAL EP
Cabo Ruivo. Feed: alcohol, naphtha, orthoxylene. Products: ammonia (90,000 mt/y), phthalic anhydride (15,000 mt/y), phthalates (20,000 mt/y).

QUIMIGAL—Química de Portugal SA
Barreiro-Lavradio. Feed: heavy fuel oil. Products: ammonia (290,000 mt/y), urea (80,000 mt/y).

PUERTO RICO

PHILLIPS PARAXYLENE INC.
Guayama. Feed: naphtha. Products: benzene (310,000 mt/y), cyclohexane (263,000 mt/y), orthoxylene (62,000 mt/y), paraxylene (260,000 mt/y), toluene (336,000 mt/y).

PHILLIPS PUERTO RICO INC.
Guayama. Feed: naphtha. Products: cyclohexane (263,000 mt/y), orthoxylene (59,000 mt/y), paraxylene (213,000 mt/y).

QATAR

QATAR FERTILIZER CO.
(75% Qatar General Petroleum Corp., 25% Norsk Hydro a.s.)
Umm Said. Feed: natural gas. Products: ammonia (725,000 mt/y), urea (780,000 mt/y).

QATAR PETROCHEMICAL CO. LTD.
(84% QPC, 16% ORKEM)
Umm Said. Feed: ethane. Products: butadiene (5,000 mt/y), ethylene (300,000 mt/y), ld polyethylene (175,000 mt/y), propylene (6,000 mt/y), pyrolysis gasoline (15,000 mt/y), sulfur (50,000 mt/y).

SAUDI ARABIA

AL-JUBAIL FERTILIZER CO.
(Sabic with Taiwan Fertilizer Co.)
Al-Jubail. Feed: methane. Product: urea (500,000 mt/y).

AL-JUBAIL PETROCHEMICAL CO.
(50% Exxon Chemical Co.)
Jubail Industrial City. Feed: ethylene. Products: high alpha olefin, lld polyethylene, hd polyethylene (330,000 mt/y).

ARABIAN PETROCHEMICAL CO.
(100% Sabic)
Al-Jubail. Feed: ethane, styrene. Product: ethylene (500,000 mt/y).

EASTERN PETROCHEMICAL CO.
(Sabic, Mitsubishi-led Japanese consortium)
Al-Jubail. Feed: ethane. Products: ethylene glycol (300,000 mt/y), polyethylene (130,000 mt/y).

IBN HAYYAN NATIONAL PLASTIC CO.
Al-Jubail. Feed: ethylene, ethylene dichloride. Products: polyvinyl chloride (200,000 mt/y), vinyl chloride (300,000 mt/y).

IBN-SINA NATIONAL METHANOL CO.
(25% Celanese, 25% Texas Eastern)
Al-Jubail. Feed: methane. Product: methanol (700,000 mt/y).

PETROMIN SHELL REFINING CO.
(Shell 50%, Petromin 50%)
Al Jubail. Product: benzene (245,000 mt/y).

SAUDI ARABIAN FERTILIZER CO.
(Sabic, Safco employees, private Saudi investors)
Al-Dammam-Khobar Highway. Feed: natural gas. Products: ammonia (600 mt/d), melamine (60 mt/d), urea (1,000 mt/d).

SAUDI METHANOL CO.
(Sabic, Mitsubishi-led Japanese consortium)
Al-Jubail. Feed: methane. Product: methanol (600,000 mt/y).

SAUDI PETROCHEMICAL CO.
(50% Pecten Arabian Co.—subsidiary of Shell Oil U.S.)
Al-Jubail. Feed: ethane, benzene. Products: ethanol (281,000 mt/y), ethyl benzene (380,000 mt/y), ethylene (656,000 mt/y), ethylene dichloride (454,000 mt/y), styrene (360,000 mt/y).

SAUDI YANBU PETROCHEMICAL CO.
(50% Mobil Oil Corp.)
Yanbu. Feed: ethane. Products: ethylene (455,000 mt/y), ethylene glycol (220,000 mt/y), ld polyethylene (100,000 mt/y), hd polyethylene (200,000 mt/y).

SINGAPORE

ETHYLENE GLYCOLS SINGAPORE PTY. LTD.
(50% Government, 30% Japanese interests, 20% Shell)
Pulau Ayer Merbau. Products: ethylene glycol (88,000 mt/y), ethylene oxide.

PHILLIPS PETROLEUM SINGAPORE CHEMICALS LTD.
(60% Phillips Petroleum International Corp., 25% Temasek Holdings Ltd., 10% Sumitomo Chemicals Co. Ltd., 5% Development Bank of Singapore Ltd.)
Singapore. Feed: ethylene. Product: hd polyethylene (160,000 mt/y).

SHELL EASTERN PETROLEUM PTY. LTD.
(100% Shell)
Pulau Bukom. Products: toluene, xylene mix, solvents.

SOUTH AFRICA

AECI LTD.
Midland, Sasolburg. Feed: coal based acetylene, ethylene. Products: acetylene (59,000 mt/y), ethylene dichloride (80,000 mt/y), ld polyethylene (95,000 mt/y), lld polyethylene (100,000 mt/y), polyvinyl chloride (163,000 mt/y), solvents (22,000 mt/y), vinyl chloride (170,000 mt/y).
Modderfontein. Feed: coal. Products: ammonia (1,000 mt/d), methanol (50 mt/d).

KARBOCHEM PTY. LTD.
(division of Sentrachem)
Newcastle. Feed: butadiene, styrene. Products: isoprene (50,000 mt/y), polybutadiene (17,500 mt/y), polyisoprene (45,000 mt/y).
Sasolburg. Product: SBR (40,000 mt/y).

KYNOCH FERTILIZER LTD.
Milnerton. Feed: refinery gas. Product: ammonia (85,000 mt/y).

NATIONAL CHEMICAL PRODUCTS LTD
(division of Sentrachem)
Germiston and Durban. Feed: benzene, molasses, naphthalene, orthoxylene. Products: acetaldehyde (15,000 mt/y), acetic acid (12,000 mt/y), ethanol (45,000 mt/y), formaldehyde (22,000 mt/y), maleic anhydride (4,000 mt/y), phthalic anhydride (32,000 mt/y).

SAFRIPOL PTY.
(50% Hoechst, 50% Sentrachem)
Sasolburg. Feed: ethylene, propylene. Products: hd polyethylene (85,000 mt/y), polypropylene (44,000 mt/y).

SASOL LTD.
Sasolburg and Secunda. Feed: coal. Product: ethylene (320,000 mt/y).

SENTRACHEM SPECIALTIES DIVISION
Durban and Germiston. Products: alkyds, polyester, polystyrene.

SPAIN

AISCONDEL SA
Monzón (Huesca). Feed: acrylonitrile, butadiene, styrene, vinyl chloride monomer. Products: ABS-SAN (15,000 mt/y), polystyrene (10,000 mt/y), polyvinyl chloride (60,000 mt/y).
Vilaseca (Tarragona). Feed: ethylene, chlorine. Products: polyvinyl chloride (55,000 mt/y), vinyl chloride monomer (150,000 mt/y).

ATOCHEM
Prat de Llobregat. Feed: styrene. Product: ABS with compounds (8,000 mt/y), polystyrene with compounds (60,000 mt/y).

BASF ESPANOLA SA
(wholly owned by BASF)
Tarragona. Feed: acrylates, butadiene, naphtha, orthoxylene, propylene, styrene. Products: butanols (20,000 mt/y), oxoalcohols-2ethylhexanol (28,000 mt/y), phthalic anhydride (16,500 mt/y), polypropylene (30,000 mt/y),polystyrene (21,000 mt/y), plasticizers (40,000 mt/y), solvents (6,600 mt/y).

BORDEN ESPANA SA
Axpe-Erandio. Feed: methanol, phenol, urea. Products: formaldehyde (60,000 mt/y), uf-pf resins (50,000 mt/y).

BRILEN SA
Barbastro. Feed: polyethylene terephthalate. Products: methanol (7,000 mt/y), polyester (25,000 mt/y).

CALATRAVA SA
Puertollano. Products: butadiene (32,000 mt/y), hd polyethylene (60,000 mt/y).
Santander. Products: carbon black (37,000 mt/y), SBR (82,000 mt/y).
Tarragona. Products: butadiene (100,000 mt/y), polyethylene (60,000 mt/y).

CARBESA—Carbon Black Espanola SA
(100% Repsol Quimica)
Algeciras. Feed: heavy aromatic oils. Product: carbon black (25,000 mt/y).

CEPSA—Compañia Española de Petroleos SA
Luchana, Vizcaya. Feed: alcohol, orthoxylene. Products: phthalic anhydride (16,000 mt/y), plasticizers (40,000 mt/y).
San Roque, Cádiz . Feed: naphtha. Products: aromatics mix (20,000 mt/y), benzene (80,000 mt/y), maleic anhydride (13,000 mt/y), orthoxylene (40,000 mt/y), paraxylene (34,000 mt/y), phthalic anhydride (20,000 mt/y), propylene (60,000 mt/y), toluene (130,000 mt/y), xylene mix (120,000 mt/y), solvents (90,000 mt/y).

DOW CHEMICAL IBERICA SA
Bilbao. Products: polystyrene, SB-latex.
Tarragona. Products: benzene, ethylene, hd-ld-lld polyethylene, propylene.

ENFERSA—Empresa Nacional de Fertilizantes SA
Cartagena, Murcia. Feed: natural gas. Products: ammonia (240,000 mt/y), urea (145,000 mt/y).
Puertollano, Ciudad Real. Feed: naphtha. Products: ammonia (180,000 mt/y), urea (125,000 mt/y).

HISPAVIC INDUSTRIAL SA
Martorell. Feed: vcm. Product: polyvinyl chloride.

INDUSTRIAS QUIMICAS ASOCIADOS SA.
(100% Shell)
Tarragona. Feed: olefins. Products: acetone (8,000 mt/y), ethylene glycol (60,000 mt/y), ethylene oxide (100,000 mt/y), isopropanol (35,000 mt/y).

INTERQUISA—Intercontinental Quimica SA
(50% Cepsa, 50% Amoco International)
San Roque. Feed: methanol, paraxylene. Products: dimethyl terephthalate (100,000 mt/y), terephthalic acid (180,000 mt/y).

PAULAR SA
Morell, Tarragona. Products: acrylonitrile (90,000 mt/y), methyl methacrylate (30,000 mt/y).

PETROQUIMICA ESPANOLA SA
(100 % Cepsa)
San Roque (Cádiz). Feed: benzene, kerosine, sulfur. Products: alkylbenzene (180,000 mt/y), linear alkylbenzene sulfonic acid (24,000 mt/y), n-paraffins (180,000 mt/y).

PRODUCTOS QUIMICOS DEL MEDITERRÁNEO SA
El Grao, Castellon de la Plana. Feed: cyclohexane. Product: caprolactam (45,000 mt/y).

REPSOL PETROLEO SA
La Coruña. Feed: isobutylene, methanol. Products: MTBE (32,000 mt/y), propylene (50,000 mt/y).
Puertollano. Feed: naphtha, refinery gases. Products: benzene (90,000 mt/y), ethylene (240,000 mt/y), propylene (180,000 mt/y).
Tarragona. Feed: isobutylene, LPG, methanol, naphtha. Products: ethylene (390,000 mt/y), MTBE (52,000 mt/y), propylene (180,000 mt/y).

REPSOL QUIMICA SA
Puertollano. Feed: olefins cracker. Products: butadiene (32,000 mt/y), ld-lld-hd polyethylene (215,000 mt/y), polyols (30,000 mt/y), polypropylene (80,000 mt/y), propylene glycol (15,000 mt/y), propylene oxide (50,000 mt/y), styrene 110,000 mt/y).
Santander. Feed: butadiene, styrene. Products: carbon black (40,000 mt/y), SBR-PB (80,000 mt/y).
Tarragona. Feed: olefins cracker. Products: acrylonitrile (90,000 mt/y), butadiene (100,000 mt/y), ld-hd polyethylene (245,000 mt/y).

RESISA—Resinas Sintéticas SA
San Celoni, Barcelona. Feed: maleic anhydride, phthalic anhydride, paraxylene, solvents. Products: polyester (17,000 mt/y), resins: (alkyd 13,000 mt/y, phenolic 2,000 mt/y, acrylic 1,000 mt/y, p.e.t. 4,000 mt/y).

RIO RODANO SA
Guturribay, Vizcaya. Feed: butadiene, styrene. Product: SBR latex (12,000 mt/y).
Hernani, Guipúzcoa. Feed: chlorine, normal paraffins, vinyl chloride monomer. Products: polyvinyl chloride (30,000 mt/y), plasticizers (3,000 mt/y).
Miranda de Ebro, Burgos. Feed: glycols, maleic anhydride, oxoalcohols, orthoxylene, vinyl chloride monomer. Products: phthalic anhydride (30,000 mt/y), polyester (22,000 mt/y), polyvinyl chloride (75,000 mt/y), plasticizers (18,000 mt/y).

TARRAGONA QUIMICA SA
(100% Hoechst)
Tarragona. Feed: olefins. Products: hd polyethylene (100,000 mt/y), polypropylene (90,000 mt/y), vinyl acetate (75,000 mt/y).

UNION EXPLOSIVOS RIO TINTO
La Rabida, Huelva. Feed: naphtha. Products: acetone (54,000 mt/y), ammonia (390,000 mt/y), benzene (120,000 mt/y), cyclohexane (80,000 mt/y), phenol (87,000 mt/y), urea (237,000 mt/y).

VINICLOR SA
Martorell, Barcelona. Feed: ethylene. Product: vinyl chloride (240,000 mt/y).

SRI LANKA

STATE FERTILIZER MANUFACTURING CORP.
Sapugaskanda. Feed: naphtha. Products: ammonia (86,476 mt/y), urea (138,458 mt/y).

SUDAN

SUDAN-REN CHEMICALS & FERTILIZER LTD.
Khartoum. Feed: naphtha. Product: ammonia (175 mt/d).

SWEDEN

DEGUSSA
Malmoe. Feed: aromatic hydrocarbons, coal tar oil. Product: carbon black.

DOW CHEMICAL
Norrkoeping. Product: SB-latex.

NESTE OXO AB
Nol. Feed: orthoxylene. Product: phthalic anhydride (25,000 mt/y).
Ornskoldsvik. Feed: butyraldehyde. Product: butanol (40,000 mt/y).
Stenungsund. Feed: phthalic anhydrice, propylene. Products: butyraldehyde (150,000 mt/y), oxoalcohols (150,000 mt/y), plasticizers (40,000 mt/y).

NESTE POLYESTER AB
Nol. Product: polyester (20,000 mt/y).

NESTE POLYETEN AB
Stenungsund. Feed: ethylene. Product: ld-hd-md-lld polyethylene (440,000 mt/y).

NORSK HYDRO PLAST AB
Stenungsund. Feed: ethylene. Products: polyvinyl chloride (115,000 mt/y), vinyl chloride (110,000 mt/y).

PERSTORP AB
Perstorp. Feed: methanol. Products: formaldehyde (200,000 mt/y), polyols, resins.

STATOIL PETROKEMI AB.
Stenungsund. Feed: naphtha, propane. Products: ethylene (370,000 mt/y), fuel oils (40,000 mt/y), propylene (180,000 mt/y), pyrolysis gasoline (130,000 mt/y).

SVENSKA POLYSTYREN FABRIKEN AB
Trelleborg. Feed: styrene. Product: polystyrene (65,000 mt/y).

SWITZERLAND

EVC
(50% ICI, 50% Enichem)
Sins. Product: polyvinyl chloride (45,000 mt/y).

LONZA AG
Visp. Feed: LVN-LPG. Products: acetaldehyde, acetic acid, acetic anhydride, acetylene (15,000 mt/y), ammonia (40,000 mt/y), aniline (3,000 mt/y), ethylene (30,000 mt/y), formaldehyde.

SYRIA

GENERAL FERTILIZER CO.
Katteneh-Homs. Feed: natural gas. Products: ammonia (250,000 mt/y), ethylene (250,000 mt/y), urea (250,000 mt/y).

TRINIDAD

FEDERATION CHEMICALS LTD.
(subsidiary of W.R. Grace & Co.)
Point Lisas. Feed: natural gas. Products: ammonia (231,300 mt/y).

FERTILIZERS OF TRINIDAD & TOBAGO LTD.
Point Lisas. Feed: anhydrous ammonia. Product: ammonia (1,100 mt/d).

TRINIDAD NITROGEN
(49% W. R. Grace & Co., and Government of Trinidad-Tobago)
Point Lisas. Feed: natural gas. Product: ammonia (370,100 mt/y).

TURKEY

ALPET—Aliaga Petrokimya San Ve Tic AS
Aliaga. Feed: naphtha. Products: acrylonitrile (70,000 mt/y), benzene (124,000 mt/y), butadiene (80,000 mt/y), ethylene (300,000 mt/y), ethylene dichloride (165,000 mt/y), ethylene glycol (68,000 mt/y), orthoxylene (65,000 mt/y), paraxylene (132,000 mt/y), phthalic anhydride (30,000 mt/y), ld polyethylene (150,000 mt/y), hd polyethylene (40,000 mt/y), polypropylene (60,000 mt/y), polyvinyl chloride (100,000 mt/y), propylene (138,000 mt/y), terephthalic acid (70,000 mt/y), toluene (40,000 mt/y), vinyl chloride (105,000 mt/y).

BASF-SUMERBANK TURK KIMYA SANAYII AS
Gebze. Feed: methanol. Product: formaldehyde (32,000 mt/y).

SASA ARTIFICIAL & SYNTHETIC FIBERS INC.
Adana. Feed: methanol, monoethylene glycol, paraxylene. Products: dimethyl terephthalate (80,000 mt/y), polyester (100,000 mt/y).

YARPET—Yarimca Petrokimya
Yarimca-Izmit. Feed: naphtha, NaCl, aromatic oil, benzene, C_4, ammonia, sulfur. Products: alkylbenzene (20,000 mt/y), butadiene (33,000 mt/y), caprolactam (25,000 mt/y), carbon black (30,000 mt/y), ethylene (55,000 mt/y), fuel oils (6,850 mt/y), polybutadiene (13,500 mt/y), ld polyethylene (24,300 mt/y), polystyrene (15,000 mt/y), polyvinyl chloride (46,800 mt/y), propylene (39,600 mt/y), pyrolysis gasoline (60,000 mt/y), styrene (19,450 mt/y), vinyl chloride (48,600 mt/y), SBR (32,150 mt/y).

UNITED KINGDOM

ATOCHEM
Stalybridge. Product: polystyrene with compounds (80,000 mt/y).

BORDEN (U.K.) LTD.
Peterlee. Feed: methanol. Products: formaldehyde (40,000 mt/y), resins.
Southampton. Feed: methanol. Products: formaldehyde (25,000 mt/y).

BP CHEMICALS LTD.
Baglan Bay. Products: benzene concentrate (150,000 mt/y), butadiene (60,000 mt/y), ethanol (155,000 mt/y), ethylene (350,000 mt/y), isopropanol (85,000 mt/y), propylene (200,000 mt/y), styrene (275,000 mt/y), toluene (6,000 mt/y), vinyl acetate (85,000 mt/y).
Carshalton. Products: solvents and plasticizers (15,000 mt/y).
Barry. Product: resins (40,000 mt/y).
Grangemouth. Products: acetone (25,000 mt/y), acrylonitrile (70,000 mt/y), benzene (250,000 mt/y), butadiene (48,000 mt/y), ethanol (155,000 mt/y), ethylene (270,000 mt/y), polybutylenes (50,000 mt/y), hd polyethylene (150,000 mt/y), ld polyethylene (90,000 mt/y), propylene (180,000 mt/y).
Hull. Products: acetic acid (400,000 mt/y), acetic anhydride (175,000 mt/y), acetone (46,000 mt/y), ethanol (25,000 mt/y), phthalic anhydride (70,000 mt/y).
Wilton. Products: butadiene (90,000 mt/y), ethylene (350,000 mt/y), ld polyethylene (85,000 mt/y), propylene (60,000 mt/y).

CIBA-GEIGY LTD.
Duxford, Cambridge. Feed: methanol. Product: formaldehyde (120,000 mt/y).

CONOCO LTD.
South Killingholme, Humberside. Feed: reformate. Product: benzene (110,000 mt/y).

DOW CHEMICAL
Barry. Product: polystyrene.

ENICHEM ELASTOMERS LTD.
Grangemouth, Scotland. Feed: butadiene, styrene, ethylene, propylene. Products: polybutadiene (45,000 mt/y), polypropylene (5,000 mt/y), SBR (30,000 mt/y), block-SBR (15,000 m/ty), ethylene-propylene rubber (15,000 mt/y).
Hythe, Hampshire. Feed: acrylonitrile, butadiene, ethylbenzene. Product: rubber (150,000 mt/y).

EXXON CHEMICAL LTD.
Fawley. Feed: petroleum fractions. Products: higher olefins (200,000 mt/y), butyl-halobutyl rubber (50,000 mt/y).

EXXON CHEMICAL OLEFINS INC.
Fawley. Feed: petroleum fractions. Products: butadiene (30,000 mt/y), ethylene (105,000 mt/y), isobutylene (60,000 mt/y), propylene (100,000 mt/y).
Mossmorran, Fife. Feed: ethane. Product: ethylene (600,000 mt/y).

IMPERIAL CHEMICAL INDUSTRIES LTD.
Polymers Group
Billingham. Products: acetone (50,000 mt/y), ammonia, methanol (500,000 mt/y), oxoalcohols (250,000 mt/y), phenol (80,000 mt/y), solvents.
North Tees. Products: benzene (400,000 mt/y), cumene, cyclohexane (300,000 mt/y), toluene, xylene mix (340,000 mt/y), solvents.
Wilton. (80% ICI—20% BP): Feed: naphtha, propane. Products: butadiene (90,000 mt/y), ethylene (750,000 mt/y), propylene (350,000 mt/y).
(ICI): Products: ethylene dichloride, ethylene glycol, ethylene oxide (240,000 mt/y), formaldehyde, nylon 66, paraxylene (330,000 mt/y), polyester, polypropylene (200,000 mt/y), terephthalic acid (490,000), plasticizers.

IMPERIAL CHEMICAL INDUSTRIES LTD.
Barry. Product: polyvinyl chloride (90,000 mt/y).
Caster-Kellner, Runcorn. Product: polyvinyl chloride (112,000 mt/y).
Hillhouse, Lancashire. Product: polyvinyl chloride (135,000 mt/y).

KEMIRA INCE LTD.
Ince. Feed: natural gas. Product: ammonia (330,000 mt/y).

KEMIRA LTD.
Hull. Feed: hydrogen. Product: ammonia (230,000 mt/y).

NORSK HYDRO POLYMERS LTD.
Aycliffe. Feed: vinyl chloride. Product: polyvinyl chloride (130,000 mt/y).

SEVALCO LTD.
(50% Columbian Chemicals, 50% Phillips Petroleum)
Avonmouth, Bristol. Feed: heavy aromatic oils. Product: furnace and thermal carbon black (70,000 mt/y).

SHELL CHEMICALS U.K. LTD.
Carrington. Feed: ethylene, ethylene oxide, propylene, propylene oxide, styrene. Products: alcohol ethoxylates (60,000 mt/y), ld polyethylene (105,000 mt/y), polypropylene (110,000 mt/y), polystyrene (50,000 mt/y).
Shell Haven. Feed: benzene. Product: linear alkylbenzene (120,000 mt/y).
Stanlow. Feed: refinery gases. Products: acetone (40,000 mt/y), benzene (450,000 mt/y), butanol (30,000 mt/y), isopropanol (100,000 mt/y), propylene (70,000 mt/y), higher olefins (220,000 mt/y), solvents.

UKF FERTILIZERS LTD.
Ince, Chester. Feed: natural gas. Products: ammonia (325,000 mt/y).

UNITED STATES

AGRICO CHEMICAL CO.
(one of the Williams Companies)
Blytheville, Ark. Feed: natural gas. Products: ammonia (320,000 mt/y), urea (340,000 mt/y).
Donaldsonville, La. Feed: natural gas. Products: ammonia (410,000 mt/y), urea (205,000 mt/y).
Verdigris, Okla. Feed: natural gas. Products: ammonia (860,000 mt/y), urea ammonium nitrate solution (1,540,000 mt/y)

AIR PRODUCTS AND CHEMICALS INC.
Calvert City, Ky. Feed: vinyl acetate, vinyl chloride. Products: acetic acid (54,545 mt/y), polyvinyl alcohol (52,272 mt/y), polyvinyl chloride (136,116 mt/y).
New Orleans, La. Feed: natural gas. Product: ammonia (280,000 mt/y).
Pensacola, Fla. Feed: ammonia, natural gas, vinyl chloride. Products: ammonia (94,000 mt/y), methanol (180,000 mt/y), polyvinyl chloride (90,700 mt/y), urea (28,000 mt/y).

ALLIED-SIGNAL INC.
Baton Rouge, La. Product: hd polyethylene (521,629 mt/y).
Chesterfield, Va. and Columbia, S.C. Product: nylons (276,781 mt/y).
Geismar, La. Product: HF (85,754 mt/y).
Hopewell, Va. Product: ammonia (364,686 mt/y), caprolactam (288,030 mt/y).
Moncure, N.C. Product: polyester (50,802 mt/y).
Philadelphia. Products: acetone (197,312 mt/y) phenol (322,049 mt/y).

AMERICAN CYANAMID CO.
Fortier, La. Feed: natural gas, propylene. Products: acrylonitrile (160,000 mt/y), ammonia (425,000 mt/y).

AMOCO CHEMICAL CO.
Cedar Bayou, Tex. Feed: propylene. Product: polypropylene (199,200 mt/y).
Chocolate Bayou, Tex. Feed: ethane, ethylene, naphtha, propane, propylene. Products: aromatics (82,000 mt/y), butadiene (93,000 mt/y), ethylene (1,073,000 mt/y), polypropylene (351,000 mt/y), propylene (445,000 mt/y).
Cooper River, S.C. Feed: paraxylene. Product: terephthalic acid (703,000 mt/y).
Decatur, Ala. Feed: paraxylene, xylene. Products: paraxylene (499,000 mt/y), terephthalic acid (865,000 mt/y).
Joliet, Ill. Feed: butane, metaxylene, styrene. Products: isophthalic acid (79,000 mt/y), maleic anhydride (36,000 mt/y), polystyrene (95,000 mt/y), trimellitic anhydride (44,000 mt/y).
Texas City, Tex. Feed: aromatics, benzene, butylenes, ethylene, propylene, xylene. Products: metaxylene (102,000 mt/y), paraxylene (598,000 mt/y), polyalphamethyl styrene (14,000 mt/y), polyisobutylene (95,000 mt/y), propylene (281,000 mt/y), solvents (207,000 mt/y), styrene (335,000 mt/y).
Torrance, Calif. Feed: styrene. Product: polystyrene (14,000 mt/y).
Whiting, Ind. Feed: butylenes, methanol. Product: MTBE (153,000 mt/y), polyisobutylene (75,000 mt/y).
Willow Springs, Ill. Feed: styrene. Products: polystyrene (32,200 mt/y).

AMOCO OIL CO.
Texas City, Tex. Feed: crude oil. Products: benzene (460,000 mt/y), toluene (910,000 mt/y), xylene mix (760,000 mt/y).
Whiting, Ind. Feed: crude oil. Products: propylene (170,000 mt/y), xylene mix (600,000 mt/y).

ARCO CHEMICAL CO.
Bayport, Tex. Feed: isobutane, propylene. Products: butyl alcohol (1,192,743 mt/y), isobutylene (170,068 mt/y), propylene glycol (163,265 mt/y), propylene oxide (521,541 mt/y).

Channelview, Tex. Products: ethylbenzene (802,721 mt/y), MTBE (19,500 b/d), phenyl ethyl alcohol (1,360 mt/y), polyols (56,689 mt/y), propylene oxide (253,968 mt/y), styrene monomer (594,104 mt/y).

Monaca, Pa. Feed: styrene. Products. polystyrene (215,419 mt/y), styrene (95,238 mt/y).

ARISTECH CHEMICAL CORP.

Florence, Kentucky. Product: acrylics (17,237 mt/y).

Haverhill, Ohio. Feed: ammonia, cumene. Products: acetone (172,367 mt/y), bisphenol A (87,091 mt/y), phenol (276,694 mt/y).

LaPorte, Tex. Feed: propylene. Product: polypropylene (172,367 mt/y).

Neal, West Va. Feed: propylene. Product: polypropylene (117,935 mt/y).

Neville Island, Pa. Feed: alcohols, dibasic acids. Products: maleic anhydride (19,051 mt/y), plasticizers (95,255 mt/y).

Neville Island, Pa., Jacksonville, Ark., Colton, Calif., Bartow, Fla. Feed: dibasic acids, alcohols, glycols, styrene. Product: polyester (104,327 mt/y).

Pasadena, Tex. Feed: orthoxylene. Product: phthalic anhydride (95,255 mt/y).

ASHLAND CHEMICAL CO.

Catlettsburg, Ky. Feed: crude oil, coal tar light oil. Products: aromatics mix (10,900 mt/y), benzene (160,000 mt/y), cumene (190,000 mt/y), toluene (110,000 mt/y), xylene mix (90,000 mt/y).

Neal, W. Va. Feed: n-butane. Product: maleic anhydride (29,492 mt/y).

Plaquemine, La. Product: methanol (130 MM gal/y).

ATLAS POWDER CO.
(subsidiary of Tyler Corp.)

Joplin, Mo. Feed: natural gas. Products: ammonia (355 mt/d), urea (195 mt/d).

BASF CORP.
Chemicals Division.

Freeport, Tex. Products: acrylic-acrylates (284 mt/y), butanol-ethylhexanol (100 mt/y), caprolactam (159 mt/y).

Geismar, La. Products: ethylene glycol (177 mt/y), ethylene oxide (218 mt/y).

South Brunswick, N.J. Product: expandable polystyrene (80 mt/y).

S. Kearny, N.J. Products: phthalic anhydride (80 mt/y), plasticizers (109 mt/y).

Various location: Products: nylons (227 mt/y), polyester (18 mt/y).

BISON NITROGEN PRODUCTS CO.
(65% Terra International, 35% W. R. Grace).

Woodward, Okla. Feed: ammonia, carbon dioxide. Product: urea (305 mt/d).

BORDEN CHEMICAL CO.
Chemical Division

Demopolis, Ala. Feed: methanol. Product: formaldehyde (36,000 mt/y).

Diboll, Tex. Feed: methanol. Product: formaldehyde (57,000 mt/y).

Fayetteville, N.C. Feed: methanol. Product: formaldehyde (193,000 mt/y).

Fremont, Calif. Feed: methanol. Product: formaldehyde (80,000 mt/y).

Kent, Wash. Feed: methanol. Product: formaldehyde (43,000 mt/y).

La Grande, Ore. Feed: methanol. Product: formaldehyde (33,000 mt/y).

Louisville, Ky. Feed: methanol. Product: formaldehyde (52,000 mt/y).

Missoula, Mont. Feed: methanol. Product: formaldehyde (62,000 mt/y).

Sheboygan, Wisc. Feed: methanol. Product: formaldehyde (78,000 mt/y).

Springfield, Ore. Feed: methanol. Product: formaldehyde (138,000 mt/y).

Vicksburg, Miss. Feed: methanol. Product: formaldehyde (32,000 mt/y).

BORDEN CHEMICALS-PLASTICS OPERATING LTD. PARTNERSHIP

Geismar, La. Feed: methanol, natural gas, ethylene, chlorine. Products: acetic acid (63,500 mt/y), acetylene (40,000 mt/y), ammonia (362,000 mt/y), formaldehyde (214,000 mt/y), methanol (601,000 mt/y), polyvinyl chloride (159,000 mt/y), urea (218,000 mt/y), vinyl chloride (363,000 mt/y).

Illiopolis, Ill. Feed: vinyl chloride, vinyl acetate. Product: polyvinyl chloride (145,000 mt/y).

BORG-WARNER CHEMICALS

North American plants. Product: ABS (362,874 mt/y).

Carville, La. (with Cosden Oil & Chemical). Feed: benzene, ethylene. Products: styrene (340,195 mt/y), toluene (17,000 mt/y).

Geismar, La. (with Union Texas Petroleum and BASF). Feed: ethane, propane. Products: butadiene (2,722 mt/y), ethylene (54,431 mt/y), propylene (2,558 mt/y). Note: Borg-Warner share only.

BP CHEMICALS AMERICA

Green Lake, Tex. Feed: ammonia, propylene. Product: acrylonitrile (270,000 mt/y).

Lima, Ohio. Feed: ammonia, natural gas, propylene. Products: acrylonitrile (160,000 mt/y), ammonia (1,360 mt/d), urea (1,300 mt/d).

BP OIL CO.

Belle Chase, La. Feed: reformate, toluene. Products: benzene (217,000 mt/y), xylene mix (200,000 mt/y).

Lima, Ohio. Feed: refinery gases, reformate, toluene. Products: benzene (330,000 mt/y), propylene (157,000 mt/y).

CABOT CORP.

Pampa, Tex.; Franklin and Ville Platte, La.; and Waverly, W. Va. Feed: gas and petroleum fractions. Product: carbon blacks (furnace process and thermal) (440,000 mt/y).

CAIN CHEMICAL INC.
(subsidiary of OxyChem)

Bayport, Tex. Feed: ethylene. Products: ethylene glycol (220,000 mt/y), ethylene oxide (235,000 mt/y), ethylene derivatives (70,000 mt/y).

Beaumont, Tex. Feed: ethylene. Products: ethylene glycol (290,000 mt/y), ethylene oxide (210,000 mt/y).

Chocolate Bayou, Tex. Feed: gas oil, drip oil, ethane, naphtha, toluene. Products: aromatics (340,000 mt/y), butadiene (60,000 mt/y), ethylene (500,000 mt/y), propylene (305,000 mt/y).

Corpus Christi, Tex. Feed: ethane, gas oil, naphtha, propane, toluene. Products: aromatics (250,000 mt/y), butadiene (95,000 mt/y), ethylene (770,000 mt/y), propylene (275,000 mt/y).

Lake Charles, La. Feed: ethane, propane. Products: butadiene (20,000 mt/y), ethylene (250,000 mt/y), propylene (85,000 mt/y).

Matagorda, Tex. Feed: ethylene. Product: hd polyethylene (295,000 mt/y).

Orange, Tex. Feed: ethylene. Product: hd polyethylene (120,000 mt/y).

Victoria, Tex. Feed: ethylene. Product: hd polyethylene (204,000 mt/y).

CAPE INDUSTRIES
(joint venture Hoechst-Celanese and American Petrofina).

Wilmington, N.C. Feed: methanol, paraxylene. Products: dimethyl terephthalate (640,000 mt/y), terephthalic acid (140,000 mt/y).

CERTAINTEED CORP.

Lake Charles, La. Feed: vinyl chloride monomer. Product: polyvinyl chloride (107,000 mt/y).

CF INDUSTRIES INC.

Donaldsonville, La. Feed: natural gas. Products: ammonia (1,570,000 mt/y), urea (980,000 mt/y).

Terre Haute, Ind. Feed: natural gas. Product: ammonia (130,000 mt/y).

CHAMPLIN REFINING CO.

Corpus Christi, Tex. Feed: refinery products. Products: benzene (155,000 mt/y), cumene (315,000 mt/y), cyclohexane (105,000 mt/y), toluene (100,000 mt/y).

CHEMBOND CORP.
(100% Priha Inc.)

Andalusia, Ala. Feed: methanol. Product: formaldehyde (45,000 mt/y).

Moncure, N.C. Feed: methanol. Product: formaldehyde (55,000 mt/y).

Springfield, Ore. Feed: methanol. Product: formaldehyde (73,000 mt/y).

Winnfield, La. Feed: methanol. Product: formaldehyde (45,000 mt/y).

CHEVRON CHEMICAL CO.
(subsidiary of Standard Oil Co. of California)

Baytown, Tex. Feed: ethylene. Products: alphaolefins (113,600 mt/y), ethylene (544,300 mt/y), butadiene (190,000 mt/y), ld polyethylene (272,000 mt/y), propylene (295,000 mt/y).

Cedar Bayou, Tex. Feed: LNG, naphtha. Product: propylene (357,000 mt/y).

Finley, Wash. Feed: natural gas. Product: ammonia (125,000 mt/y).

Marietta, Ohio. Feed: styrene. Product: polystyrene (217,000 mt/y).

Orange, Tex. Feed: ethylene. Product: ld polyethylene (136,000 mt/y), hd polyethylene (261,700 mt/y).

Pascagoula, Miss. Feed: petroleum base stocks. Product: paraxylene (238,000 mt/y).

Philadelphia, Pa. Feed: petroleum base stocks. Products: benzene (127,000 mt/y), cumene (204,000 mt/y), toluene (102,000 mt/y).

Port Arthur, Tex. Feed: petroleum base stocks. Products: benzene (487,000 mt/y), butadiene (22,000 mt/y), cumene (408,000 mt/y), cyclohexane (112,000 mt/y), ethylene (385,000 mt/y), propylene (204,000 mt/y), toluene (234,000 mt/y).

St. Helens, Ore. Feed: natural gas. Products: ammonia (250 t/d), urea (350 t/d).

St. James, La. Feed: ethylene. Product: styrene (293,000 mt/y).

CITGO PETROLEUM CORP.

Lake Charles, La. Feed: crude. Products: propylene (119,400 mt/y).

COASTAL EAGLE POINT OIL CO.

Westville, N.J. Feed: crude oil. Product: cumene (94,000 mt/y).

COASTAL REFINING AND MARKETING INC.

Products: benzene (246,000 mt/y), xylene mix (77,000 mt/y).

COLUMBIA NITROGEN CORP.

Augusta, Ga. Feed: natural gas. Products: ammonia (500,000 mt/y), urea (360,000 mt/y).

COLUMBIAN CHEMICALS CO.

El Dorado, Ark., Franklin, La., Mojave, Calif., Moundsville, W. Va., Ulysses, Kans. Feed: heavy aromatic hydrocarbons. Product: carbon black (293,000 mt/y).

COMINCO AMERICAN INC.

Borger, Tex. Feed: natural gas. Products: ammonia (325,000 mt/y), urea (70,000 mt/y).

CONCARB DIVISION, WITCO CORP.

Phenix City, Ala. Feed: heavy aromatic oil. Product: carbon black (27,215 mt/y).

Ponca City, Okla. Feed: heavy aromatic oil. Product: carbon black (68,000 mt/y).

Sunray, Tex. Feed: heavy aromatic oil. Product: carbon black (54,000 mt/y).

COPOLYMER RUBBER & CHEMICAL CORP.

Addis, La. Feed: petroleum derivative. Product: ethylene-propylene rubber (40,000 mt/y).

Baton Rouge, La. Feed: petroleum derivatives. Products: styrene-butadiene rubber (190,000 mt/y).

CROWN CENTRAL PETROLEUM CORP.

Pasadena, Tex. Feed: crude oil. Product: propylene (90,800 mt/y).

DEGUSSA.

Aransas Pass, Tex. Product: carbon black (50,000 mt/y).

Belpre, Ohio. Product: carbon black (55,000 mt/y).

Ivanhoe, La. Product: carbon black (100,000 mt/y).

Mobile, Ala. Product: (24,000 mt/y).

DIAMOND SHAMROCK REFINING & MARKETING CO.

Sunray, Tex. Feed: natural gas. Product: ammonia (400 mt/d).

DIXIE CHEMICAL CO.

Bayport, Tex. Feed: acrylic monomers. Product: acrylics (4,500 mt/y).

DOW CHEMICAL

Freeport, Tex. Products: acetylene (4,000 mt/y), acrylonitrile-butadiene-styrene (136,000 mt/y), ammonia (47,000 mt/y), benzene (535,000 mt/y), bisphenol A (77,000 mt/y), ethylbenzene (795,000 mt/y), ethylene (1,820,000 mt/y), ethyl chloride (35,000 mt/y), ethylene dichloride (727,000 mt/y), ethylene glycol (115,000 mt/y), ethylene oxide (130,000 mt/y), phenol (211,000 mt/y), hd polyethylene (75,000 mt/y), ld polyethylene (400,000 mt/y), propylene (250,000 mt/y), propylene glycol (114,000 mt/y), propylene oxide (435,000 mt/y), styrene (590,000 mt/y).

Ironton, Ohio. Products: acrylonitrile (29,000 mt/y), polystyrene.

Oyster Creek (Freeport), Tex. Products: acetone (127,000 mt/y), ethylene dichloride (500,000 mt/y), vinyl chloride (350,000 mt/y).

Plaquemine, La. Products: ethylene (682,000 mt/y), ethylene dichloride (900,000 mt/y), ethylene glycol (204,000 mt/y), ethylene oxide (206,000 mt/y), hd polyethylene (120,000 mt/y), ld polyethylene (350,000 mt/y), propylene (75,000 mt/y), propylene glycol (68,000 mt/y), propylene oxide (200,000 mt/y), plasticizers (54,000 mt/y).

Torrance, Calif. Products: acrylonitrile (34,000 mt/y), polystyrene (453,000 mt/y).

ETHYL CORP.

Orangeburg, S.C. Feed: ethylene. Product: alkylbenzene.

Pasadena, Tex. Feed: ethylene. Product: alphaolefins, ethylchloride, ethylene dichloride.

EXXON CHEMICAL AMERICAS

Baton Rouge, La. Feed: petroleum intermediates. Products: benzene, butadiene, butylenes, carbon black feedstocks, ethylene, ethylene vinyl acetate copolymers, heart cut distillates, higher olefins, isoparaffins, isoprene, isopropanol, oxoalcohols, phthalic anhydride, ld polyethylene, propylene, vinyl acetate, plasticizers, resins, butyl rubber, chlorobutyl, ep rubber, solvents.

Baytown, Tex. Feed: petroleum intermediates. Products: benzene, butadiene, butene 1, ethylene, isoamylene, isobutylene, MTBE, orthoxylene, paraffins, paraxylene, polybutene polymers, polypropylene, polyisobutylene, propylene, butyl rubber.

Bayway, N.J. Feed: petroleum intermediates. Products: polyisobutylene, propylene, solvents.

Mont Belvieu, Tex. Products: linear ld polyethylene, hd polyethylene.

FARMLAND INDUSTRIES INC.

Beatrice, Neb. Feed: natural gas. Product: ammonia (590 mt/d).

Dodge City, Kan. Feed: natural gas. Product: ammonia (590 mt/d).

Enid, Okla. Feed: natural gas. Product: ammonia (2,260 mt/d), urea (900 mt/d).

Fort Dodge, Iowa. Feed: natural gas. Product: ammonia (570 mt/d).

Lawrence, Kan. Feed: natural gas. Products: ammonia (1,040 mt/d), urea (680 mt/d).

Pollock, La. Feed: natural gas. Product: ammonia (1,140 mt/d).

FINA OIL & CHEMICAL CO.

Big Spring, Tex. Feed: crude oil. Product: benzene (25,000 mt/y),propylene (30,000 mt/y).

Calumet City, Ill. Feed: styrene. Product: polystyrene (90,718 mt/y).

Carville, La. Feed: benzene, ethylene. Products: polystyrene (155,000 mt/y), styrene (340,300 mt/y).

LaPorte, Tex. Feed: ethylene, propylene. Product: polypropylene (408,234 mt/y).

Port Arthur, Tex. Feed: crude oil. Products: benzene (171,000 mt/y), propylene (55,000 mt/y), xylene mix (295,000 mt/y).

FIRESTONE SYNTHETIC RUBBER & LATEX CO.

Lake Charles, La. Feed: butadiene, styrene. Product: SBR (120,000 mt/y).

Orange, Tex. Feed: duradene. Products: polybutadiene (110,000 mt/y).

GENCORP POLYMER PRODUCTS.

Mogadore, Ohio. Feed: butadiene, styrene, vinyl pyridine, vinylidene chloride. Product: SBR (93,000 mt/y).

GENERAL TIRE INC.
(A GenCorp Co.)

Odessa, Tex. Feed: butadiene, styrene. Product: SBR (99,793 mt/y).

GEORGIA GULF CORP.

Delaware City, Del. Feed: vinyl chloride. Products: polyvinyl chloride (68,000 mt/y).

Pasadena, Tex. Feed: benzene, propylene. Product: cumene (567,000 mt/y).

Plaquemine, La. Feed: chlorine, cumene, ethylene, hydrogen, natural gas, VCM. Products: acetone (117,500 mt/y), ammonia (190,500 mt/y), methanol (424,000 mt/y), phenol (190,500 mt/y), polyvinyl chloride (317,500 mt/y), vinyl chloride (499,000 mt/y).

GEORGIA-PACIFIC CORP.

Albany, Oregon. Feed: methanol. Product: formaldehyde (77,111 mt/y).

Bellingham, Wash. Feed: pulp mill liquor. Product: ethanol (17,935 mt/y).

Columbus, Ohio. Feed: methanol. Product: formaldehyde (74,843 mt/y).

Conway, N.C. Feed: methanol. Product: formaldehyde (47,628 mt/y).

Crossett, Ark. Feed: methanol. Product: formaldehyde (74,843 mt/y).

Lufkin, Tex. Feed: methanol. Product: formaldehyde (47,628 mt/y).

Russellville, S.C. Feed: methanol. Product: (99,791 mt/y formaldehyde).

Taylorsville, Miss. Feed: methanol. Product: formaldehyde (72,575 mt/y).

Vienna, Ga. Feed: methanol. Product: formaldehyde (47,628 mt/y).

BFGOODRICH CO. GEON VINYL DIVISION

Avon Lake, Ohio, Calvert City and Louisville, Ky., Deer Park and LaPorte, Tex., Henry, Ill., Long Beach, Calif., Pedricktown, N.J., Plaquemine, La., Terre Haute, Ind. Products: vinyl chloride monomer and vinyl resins.

GOODYEAR TIRE & RUBBER CO.

Beaumont, Tex. Feed: C-5 streams, butadiene. Products: isoprene (81,600 mt/y), polyisoprene (60,000 mt/y), polybutadiene (182,000 mt/y).

Calhoun, Ga. Feed: butadiene, styrene. Product: SBR (41,000 mt/y).

Houston, Tex. Feed: acrylonitrile, butadiene-styrene. Products: acrylonitrile-butadiene rubber (14,000 mt/y), styrene-butadiene rubber (310,000 mt/y).

Niagara Falls, N.Y. Feed: vinyl chloride monomer. Product: polyvinyl chloride (54,000 mt/y).

Point Pleasant, W. Va. Feed: tpa, ethylene glycol. Product: polyester (154,000 mt/y).

W.R. GRACE & CO.

Memphis, Tenn. Feed: natural gas. Products: ammonia (306,400 mt/y), urea (349,300 mt/y).

GREEN VALLEY CHEMICAL CORP.

Creston, Iowa. Feed: natural gas. Product: ammonia (100 mt/d).

HAWKEYE CHEMICAL CO.

Clinton, Iowa. Feed: natural gas and hydrogen. Products: ammonia (200,000 mt/y), urea (60,000 mt/y).

HERCULES INC.

Louisiana, Mo. Feed: natural gas. Product: formaldehyde (80,000 mt/y).

HILL PETROLEUM CO.

Houston, Tex. Feed: crude and intermediate feedstocks. Products: benzene (14,000 mt/y), ethylbenzene (29,000 mt/y), MTBE (61,000 mt/y), normal paraffins (26,000 mt/y), propylene (163,000 mt/y), toluene (48,000 mt/y), xylene mix (53,000 mt/y).

Texas City, Tex. Feed: crude. Product: propylene (86,000 mt/y).

HIMONT USA INC.

Bayport, Tex. Feed: propylene. Product: polypropylene (380,000 mt/y).

Lake Charles, La. Feed: propylene. Product: polypropylene (380,000 mt/y).

HOECHST CELANESE CHEMICAL GROUP.
(subsidiary of Hoechst Celanese Corp.)

Bay City, Tex. Feed: ethylene, propylene. Product: butanol (113,000 mt/y), butaraldehyde (113,000 mt/y), vinyl acetate (216,000 mt/y).

Bishop, Tex. Feed: natural gas. Products: formaldehyde (818,000 mt/y), methanol (393,000 mt/y).

Clear Lake, Tex. Feed: natural gas, ethylene. Products: acetic acid (409,000 mt/y), acrylic acid-esters (136,000 mt/y), ethylene glycol (227,000), ethylene oxide (205,000 mt/y), vinyl acetate (200,000 mt/y).

Newark, N.J. Feed: methanol. Product: formaldehyde (55,000 mt/y).

Pampa, Tex. Feed: butane. Product: acetic acid (250,000 mt/y), acetic anhydride.

Rock Hill, S.C. Feed: methanol. Product: formaldehyde (55,000 mt/y).

J.M. HUBER CORP.

Baytown, Tex. Feed: refinery bottoms. Product: carbon black (318 mt/d).

Borger, Tex. Feed: refinery bottoms. Product: carbon black (235 mt/d).

Orange, Tex. Feed: refinery bottoms. Product: carbon black (167 mt/d).

HÜLS AMERICA INC.

Chestertown, Md. Feed: alcohols, phthalic anhydride. Product: plasticizers (36,000 mt/y).

IMC FERTILIZER INC.

Sterlington, La. Feed: natural gas. Product: ammonia (900,000 mt/y).

KOPPERS CI

Bridgeville, Pa. Product: polyester.

Chicago, Ill. Feed: naphthalene, orthoxylene. Products: phthalic anhydride (57,000 mt/y), polyester.

Follansbee, W. Va. Feed: coal tar. Product: naphthalene (70,000 mt/y).

Oxnard, Calif. Product: polyester.

Richmond, Calif. Product: polyester.

LaROCHE INDUSTRIES INC.

Cherokee, Alabama. Feed: natural gas. Product: ammonia (175,000 mt/y).

LYONDELL PETROCHEMICAL CO.

Channelview, Tex. Feed: ethane, gas oils, naphthas, mixed C_4's, natural gas, propane. Products: benzene (274,000 mt/y), butadiene (216,000 mt/y), butylenes (209,000 mt/y), ethylene (1,270,000 mt/y), isoprene (41,000 mt/y), methanol (662,000 mt/y), propylene (839,000 mt/y), toluene (100,000 mt/y).

Houston, Tex. Feed: refinery feeds. Products: benzene (184,000 mt/y), orthoxylene (110,000 mt/y), paraxylene (150,000), toluene (100,000 mt/y).

MARATHON PETROLEUM CO.

Detroit, Mich. Feed: refinery. Product: propylene (58,000 mt/y).

Garyville, La. Feed: refinery. Product: propylene (69,000 mt/y).

Texas City, Tex. Feed: refinery. Products: benzene (27,500 mt/y), propylene (65,000 mt/y), toluene (75,000 mt/y), xylene mix (48,400 mt/y).

MELAMINE CHEMICALS INC.

Donaldsonville, La. Feed: urea. Product: melamine (45,000 mt/y).

MISSISSIPPI CHEMICAL CORP.

Yazoo City, Miss. Feed: natural gas. Product: ammonia (1,160 mt/d), urea (490 mt/d).

MOBIL CHEMICAL CO.

(division of Mobil Oil Corp.)

Beaumont, Tex. Feed: natural gas liquids, reformate. Products: benzene (300,000 mt/y), butadiene (27,000 mt/y), butylenes (14,000 mt/y), ethylene (499,000 mt/y), polyethylene (465,000 mt/y), propylene (136,000 mt/y), toluene (148,000 mt/y).

Chalmette, La. Feed: reformate. Products: benzene (69,100 mt/y), orthoxylene (61,500 mt/y), paraxylene (67,700 mt/y), toluene (126,200 mt/y), xylene mix (13,900 mt/y), solvents (53,200 mt/y).

Houston, Tex. Feed: natural gas liquids. Products: ethylene (227,000 mt/y), propylene (82,000 mt/y).

Holyoke, Mass. Feed: styrene. Products: polystyrene (36,000 mt/y).

Joliet, Ill. Feed: styrene. Product: polystyrene (166,000 mt/y).

Santa Ana, Calif. Feed: styrene. Product: polystyrene (27,000 mt/y).

MONSANTO

Addyston, Ohio; Muscatine, Iowa. Product: ABS (259,000 mt/y).

Alvin, Tex. Feed: propylene. Product: acrylonitrile (210,000 mt/y).

Luling, La. Feed: natural gas. Product: ammonia (210,000 mt/y).

Pensacola, Fla. Feed: butane. Product: maleic anhydride (109,000 mt/y).

NIPRO INC.

(NV DSM subsidiary)

Augusta, Ga. Feed: cyclohexane. Product: caprolactam (165,000 mt/y).

N-REN CORP.

Carlsbad, N.M. Feed: natural gas. Product: ammonia (70,000 mt/y).

East Dubuque, Ill. Feed: natural gas. Products: ammonia (250,000 mt/y).

Pine Bend, Minn. Feed: natural gas. Product: ammonia (27,000 mt/y).

Pryor, Okla. Feed: natural gas. Products: ammonia (75,000 mt/y).

OCCIDENTAL CHEMICAL CORP.

Addis, La. Feed: vinyl chloride. Product: polyvinyl chloride (181,000 mt/y).

Burlington North, N.J. Feed: vinyl chloride. Product: polyvinyl chloride (54,000 mt/y).

Burlington South, N.J. Feed: vinyl chloride. Product: polyvinyl chloride (54,000 mt/y).

Convent, La. Product: ethylene dichloride (363,000 mt/y).

Deer Park, Tex. Feed: ethylene, chlorine. Products: ethylene dichloride (74,000 mt/y), vinyl chloride (500,000 mt/y).

Pasadena, Tex. Feed: vinyl chloride monomer. Product: polyvinyl chloride (431,000 mt/y).

Pottstown, Pa. Feed: vinyl chloride. Product: polyvinyl chloride (100,000 mt/y).

Tacoma, Wash. Feed: hydrogen, nitrogen. Product: ammonia (30,000 mt/y).

OKLAHOMA NITROGEN CO.

(62.5% W.R. Grace, 37.5% Terra International)

Woodward, Okla. Feed: natural gas. Products: ammonia (450,000 mt/y), urea (100,000 mt/y).

OLIN CORP.

Lake Charles, La. Feed: natural gas. Products: ammonia (480,000 mt/y), urea (214,000 mt/y).

PHILLIPS 66 CO.

Borger, Tex. Feed; crude oil, NGL. Product: cyclohexane (130,000 mt/y).

Pasadena, Tex. Feed: butadiene, ethylene, propylene, styrene. Products: hd polyethylene (718,000 mt/y), polypropylene (227,000 mt/y), styrene-butadiene resin (82,000 mt/y).

Sweeny, Tex. Feed: benzene, crude oil, natural gas liquids. Products: benzene (50,000 mt/y), cyclohexane (288,000 mt/y), ethylene (1,045,000 mt/y), propylene (254,000 mt/y), toluene (120,000 mt/y), xylene mix (108,000 mt/y).

POLYSAR INC.

Copley, Ohio. Feed: styrene. Product: polystyrene (70,000 mt/y).

Decatur, Ala. Feed: styrene. Product: polystyrene.

Forest City, N.C. Product: polystyrene (18,000 mt/y).

Leominster, Mass. Feed: styrene. Product: polystyrene (82,000 mt/y).

Orange, Tex. Feed: butadiene, ethylene, propylene. Products: butadiene rubber (88,000 mt/y), edpm (35,000 mt/y).

Springfield, Mass. Feed: styrene. Product: polystyrene.

PPG INDUSTRIES INC.

Lake Charles, La. Feed: ethylene. Products: ethylchloride (68,000 mt/y), ethylene dichloride (665,000 mt/y), vinyl chloride (420,000 mt/y).

QUANTUM CHEMICAL CORP.- USI Division

Clinton, Iowa. Feed: ethane-propane mix. Products: butadiene (17,000 mt/y), ethylene (365,000 mt/y), ld polyethylene (195,500 mt/y), hd polyethylene (159,000 mt/y), propylene (14,000 mt/y).

Chocolate Bayou, Tex. Product: hd polyethylene (181,800 mt/y).

Houston, Texas. Feed: carbon monoxide, ethylene, methanol. Products: acetic acid (363,600 mt/y), ld polyethylene (207,000 mt/y), hd polyethylene (250,000 mt/y), vinyl acetate (272,200 mt/y).

Morris, Ill. Feed: butane, ethane, propane. Products: butadiene (110,000 mt/y), ethylene (455,000 mt/y), ethylene glycol (96,500 mt/y), ethylene oxide (41,000 mt/y), ld polyethylene (245,500 mt/y), lld polyethylene (113,600 mt/y), polypropylene (120,400 mt/y), propylene (110,000 mt/y).

Port Arthur, Texas. Feed: ethylene. Products: lld polyethylene (136,400 mt/y), ld polyethylene (86,000 mt/y), hd polyethylene (154,500 mt/y).

Tuscola, Illinois. Feed: ethylene. Products: ethanol (198,000 mt/y), ethylene (182,000 mt/y), ld polyethylene (77,000 mt/y).

REICHHOLD CHEMICAL INC.

Hampton, S.C. Feed: methanol. Product: formaldehyde.

Houston, Tex. Feed: methanol. Product: formaldehyde.

Kansas City, Kans. Product: formaldehyde.

Tacoma, Wash. Product: formaldehyde.

REXENE PRODUCTS CO.

Bayport, Tex. Feed: ethylene, propylene. Product: ld polyethylene (110,000 mt/y), polypropylene (140,000 mt/y).

Odessa, Tex. Feed: benzene, ethane, propane. Products: ethylene (230,000 mt/y), polyethylene (186,000 mt/y), polypropylene (100,000 mt/y), propylene (100,000 mt/y), styrene (140,000 mt/y).

ROHM AND HAAS CO.

Bayport, Tex; Bristol and Croydon, Pa; Calumet City, Ill; Fayetteville, N.C.; Hayward, Calif; Louisville, Ky. Products: acrylics, acrylic esters, plasticizers, polyester, polyethylene, specialty acrylic monomers and polymers.

Deer Park, Texas. Feed: natural gas, propylene. Products: acrylic acid and esters (280,000 mt/y).

RUBICON INC.

Geismar, La. Feed: benzene. Product: aniline (136,000 mt/y).

SHELL CHEMICAL CO.

Deer Park, Tex. Feed: natural gas liquids, petroleum fractions. Products: acetone (195,000 mt/y), benzene (500,000 mt/y), bisphenol A (160,000 mt/y), butadiene (226,000 mt/y), cumeme (360,000 mt/y), ethylene (1,315,000 mt/y), isoprene concentrate (49,000 mt/y), isopropanol (225,000 mt/y), methyl isobutyl ketone (27,000 mt/y), normal butyl alcohol (65,000 mt/y), normal paraffins (99,000 mt/y), phenol (247,000 mt/y), propylene (770,000 mt/y), resins (90,000 mt/y), toluene (170,000 mt/y), vinyl chloride (380,000 mt/y), xylene mix (180,000 mt/y).

Geismar, La. Feed: ethylene. Products: linear C_4 + olefins (317,000 mt/y), ethylene glycol (227,000 mt/y), ethylene oxide (365,000 mt/y), glycol ethers (30,000 mt/y).

Marietta, Ohio. Product: thermoplastic rubber (170,000 mt/y).

Norco, La. Feed: natural gas liquids, petroleum fractions. Products: butadiene (226,000 mt/y), ethylene (1,016,000 mt/y), MEK (105,000 mt/y), polypropylene (136,000 mt/y), propylene (635,000 mt/y), vinyl chloride (320,000 mt/y).

Odessa, Tex. Product: benzene (16,000 mt/y).

Taft, La. Product: polybutylene (30,000 mt/y).

Wood River, Ill. Product: benzene (150,000 mt/y).

SHELL CHEMICAL CO. and UNION CARBIDE CORP.

(Joint ownership)

Seadrift, Tex. Product: polypropylene (90,000 mt/y).

SHINTECH INC.

Freeport, Tex. Feed: vinyl chloride monomer. Product: polyvinyl chloride (680,000 mt/y).

SID RICHARDSON CARBON CO.

Addis, La. Feed: heavy oil and natural gas. Product: carbon black (61,000 mt/y).

Big Spring, Tex. Feed: heavy oil. Product: carbon black (53,000 mt/y).

Borger, Tex. Feed: heavy oil. Product: carbon black (97,000 mt/y).

SIMPLOT & CO., J.R.

Pocatello, Idaho. Feed: natural gas. Product: ammonia (275 mt/d)

SOLTEX POLYMER CORP.

(subsidiary of Solvay & Cie.)

Deer Park, Tex. Feed: ethylene, propylene. Product: lld and hd polyethylene (1,225 MM lbs/y), polypropylene (450 MM lbs/y).

STEPAN CO.

Joliet, Ill. Feed: orthoxylene. Product: phthalic anhydride (77,000 mt/y).

SUN REFINING & MARKETING CO.

Marcus Hook, Pa. Feed: crude, purchased naphthas. Products: benzene (100,000 mt/y), ethylene (86,000 mt/y), ethylene oxide (44,000 mt/y), propylene (200,000 mt/y), toluene (75,000 mt/y), xylene mix (100,000 mt/y).

Toledo, Ohio. Feed: crude. Products: benzene (60,000 mt/y), toluene (200,000 mt/y), xylene mix (200,000 mt/y).

Tulsa, Okla. Feed: crude. Products: benzene (5,000 mt/y), cyclohexane (100,000 mt/y).

SUNOLIN CHEMICAL CO.

Claymont, Del. Feed: refinery dry gas, oxygen. Products: ethylene (108,863 mt/y), ethylene oxide (45,352 mt/y).

TENNECO OIL CO.

Pasadena, Tex. Feed: natural gas. Product: methanol (407,697 mt/y).

TENNESSEE VALLEY AUTHORITY

Muscle Shoals, Ala. Feed: natural gas. Products: ammonia (200 mt/d), urea (300 mt/d).

TERRA INTERNATIONAL INC.

Sioux City (Port Neal), Iowa. Feed: natural gas. Products: ammonia (720 mt/d), urea (730 mt/d).

Woodward, Okla. Feed: natural gas. Product: ammonia (1,300 mt/d).

TEXACO CHEMICAL CO.

Delaware City, Del. Feed: petroleum fractions. Products: benzene (73,000 mt/y), naphthalene (35,000 mt/y), toluene (55,000 mt/y).

El Dorado, Kans. Feed: petroleum fractions. Products: acetone (25,000 mt/y), benzene (56,000 mt/y), cumene (64,000 mt/y), phenol (43,000 mt/y), toluene (60,000 mt/y).

Port Arthur, Tex. Feed: gas oil, NGL, naphtha, naphtha fractions. Products: aromatics (250,000 mt/y), benzene (165,000 mt/y), butadiene (51,000 mt/y), cyclohexane (200,000 mt/y), ethylene (550,000 mt/y), propylene (275,000 mt/y).

Port Neches, Tex. Feed: NGL. Products: butadiene (225,000 mt/y), ethylene (160,000 mt/y), ethylene glycol (333,000 mt/y), ethylene oxide (385,000 mt/y), propylene (135,000 mt/y).

TEXAS EASTMAN CO.

Harrison County, Tex. Feed: ethane, propane. Products: acetaldehyde (242,000 mt/y), aromatics mix (67,000 mt/y), butanol (100,000 mt/y), butylenes-butadiene mix (50,000 mt/y), butyraldehyde (370,000 mt/y), ethanol (89,000 mt/y), ethylene (650,000 mt/y), ethylene glycol (110,000 mt/y), ethylene oxide (100,000 mt/y), oxoalcohols (250,000 mt/y), ld polyethylene (300,000 mt/y), polypropylene (70,000 mt/y), propylene (300,000 mt/y), solvents (200,000 mt/y).

TEXAS PETROCHEMICALS CORP.
(subsidiary of Texas Olefins Co.)

Houston, Tex. Feed: mixed C_4 olefins, diolefins, isobutane, methanol. Products: butadiene (350,000 mt/y), butene 1 (90,000 mt/y), diisobutylene (30,000 mt/y), isobutylene (25,000 mt/y), MTBE (470,000 mt/y).

TRIAD CHEMICAL CO.
(joint venture Mississippi Chemical and First Mississippi Corp.)

Donaldsonville, La. Feed: natural gas. Products: ammonia (1,100 mt/y), urea (1,350 mt/y).

UNION CARBIDE CORP.

Bound Brook, N.J. Feed: cumene, petroleum derived feedstocks, derivatives. Products: acetone (50,000 mt/y), formaldehyde (45,000 mt/y), phenol (80,000 mt/y), polystyrene.

Seadrift, Tex. Feed: ethane, propane. Products: acetylene (9,000 mt/y), butadiene, ethylbenzene (170,000 mt/y), ethylene (562,300 mt/y), ethylene glycol, ethylene oxide, oxoalcohols, ld polyethylene (227,000 mt/y), lld-hd polyethylene (455,000 mt/y), polypropylene (90,000 mt/y), propylene, styrene (136,000 mt/y), solvents.

Taft, La. Feed: ethane, propane, butane, paraffinate, naphtha. Products: acetic acid, acetylene (5,000 mt/y), acrylic acid and acrylic esters (90,000 mt/y), benzene (230 mt/y), butadiene, ethylene (498,900 mt/y), ethylene dichloride (70,000 mt/y), ethylene glycol, ethylene oxide, lld-hd polyethylene (364,000 mt/y), propylene.

Texas City, Tex. and Ponce, Puerto Rico. Feed: butadiene, ethylene, propylene. Products: acetylene (63,000 mt/y), butanol (168,000 mt/y), butyraldehyde (195,000 mt/y), ethanol (339,000 mt/y), ethylene—Ponce (412,700 mt/y), ethylene—Texas City (702,300 mt/y), isopropanol (349,000 mt/y).

UNOCAL CHEMICALS DIVISION

Beaumont, Tex. Feed: reformate. Products: benzene (51,100 mt/y), cyclohexane (50,000 mt/y), toluene (95,800 mt/y), xylene mix (105,900 mt/y).

Brea, Calif. Feed: natural gas. Products: ammonia (227,000 mt/y), urea (109,000 mt/y).

Bridgeview and Lemont, Ill. Product: polymers (62,900 mt/y).

Charlotte, N.C. Product: polymers (133,000 mt/y).

Kenai, Alaska. Feed: natural gas. Products: ammonia (1,034,000 mt/y), urea (907,000 mt/y).

La Mirada and Newark, Calif. Products: polymers (73,200 mt/y).

Lemont, Ill. Feed: reformate, primary light oil. Products: benzene (92,000 mt/y), toluene (50,400 mt/y), xylene mix (35,300 mt/y).

UNIROYAL CHEMICAL CO.

Geismar, La. Feed: ethylene, propylene. Product: ethylene-propylene rubber (44,000 mt/y).

VISTA CHEMICAL CO.

Aberdeen, Miss. and Oklahoma City, Okla. Feed: vinyl chloride monomer. Product: polyvinyl chloride (363,000 mt/y).

Baltimore, Md. Feed: benzene, n-paraffins. Products: alkylbenzene (118,000 mt/y).

West Lake, La. Feed: benzene, ethane, kerosine. Products: alkylbenzene (91,000 mt/y), aromatics (8,000 mt/y), butadiene (15,000 mt/y), ethylene (317,000 mt/y), n-paraffins (150,000 mt/y), propylene (8,000 mt/y), vinyl chloride (360,000 mt/y).

VULCAN MATERIALS CO.

Geismar, La. Feed: ethylene. Product: ethylene dichloride (150,000 mt/y).

URUGUAY

ITALCOLOR SA

San José. Feed: methanol. Product: formaldehyde (7,200 mt/y).

VENEZUELA

ESTIZULIA—Estireno del Zulia
(37.5% Pequiven, 37.5% Grupo Zuliano CA, 25% Dow Chemical)

Zulia-El Tablazo Complex. Feed: styrene. Products: polystyrene (40,000 mt/y).

INT[illegible]UM—Química Integrada

Va[illegible]ia. Products: acrylics (7,800 mt/y), alkyds (8,000 mt/y), formaldehyde (7,400 mt/y), polyester (5,600 mt/y).

NEGROVEN

Valencia. Feed: aromatic oil. Product: carbon black (40,000 mt/y).

NITROVEN—Venezolana del Nitrogeno
(Pequiven, Instituto Fomento Industrial, International Development & Investment Co. Ltd.)

Zulia-El Tablazo Complex. Feed: natural gas. Products: ammonia (594,000 mt/y-two units), urea (792,000 mt/y-two units).

OXIDOR—Oxidaciones Orgánicas
(59.44% Corimon, 29.13% Corpoquim, 11.3% Pequiven)

Valencia, Edo. Carabobo. Feed: orthoxylene. Product: phthalic anhydride (18,000 mt/y).

PEQUIVEN—Petroquimica de Venezuela.

Morón, Edo Carabobo. Feed: natural gas. Products: ammonia (198,000 mt/y), urea (248,000 mt/y).

Zulia-El Tablazo Complex. Feed: ethane, natural gas, propane. Products: ethylene (150,000 mt/y), propylene (35,000 mt/y).

PETROPLAS—Plásticos Petroquímica
(100% Pequiven)

Zulia-El Tablazo. Feed: chlorine, ethylene. Products: ethylene dichloride (72,000 mt/y), polyvinyl chloride (40,000 mt/y), vinyl chloride (44,000 mt/y).

PLASTILAGO—Plásticos del Lago
(49% Pequiven, 31.45% Grupo Zuliano CA, 15% CdF Chimie, 4.55% Mitsui Petrochemical)

Zulia-El Tablazo. Feed: ethylene. Product: hd polyethylene (60,000 mt/y).

POLILAGO—Polimeros del Lago.
(40% Pequiven, 30% Grupo Zuliano CA, 30% Cdf Chimie)

Zulia-El Tablazo Complex. Feed: ethylene. Product: ld polyethylene (60,000 mt/y).

QUÍMICA VENOCO
(Shell 15%, Industrias Venoco 55%, Pequiven 15%, Phillips Investment 15%)

Guacara, Edo. Carabobo. Feed: benzene, propylene. Products: alkylbenzene (56,000 mt/y).

VIRGIN ISLANDS

ST CROIX PETROCHEMICAL CORP.
(joint venture Amerada Hess Corp. and Hercofina)

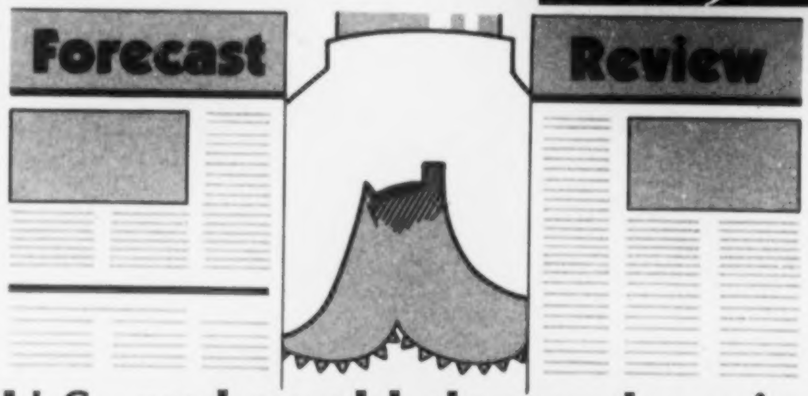
St. Croix. Feed: mixed xylenes. Product: paraxylene (275,000 mt/y).

YUGOSLAVIA

DOW CHEMICAL CO.

Zagreb. Product: polystyrene.

OGJ SPECIAL



U.S. and world demand up in 1989; U.S. output will decline again

Robert J. Beck
Economics Editor

Robust economic growth, a surge in energy consumption, and slightly lower petroleum product prices combined to boost U.S. oil demand in 1988.

Demand will grow more slowly this year. Economic growth is expected to moderate in 1989, partly due to higher interest rates, and product prices will be slightly higher.

But prices should still be low enough to stimulate increased demand.

Another year of depressed exploration and drilling activity resulted in a further slide in U.S. production in 1988.

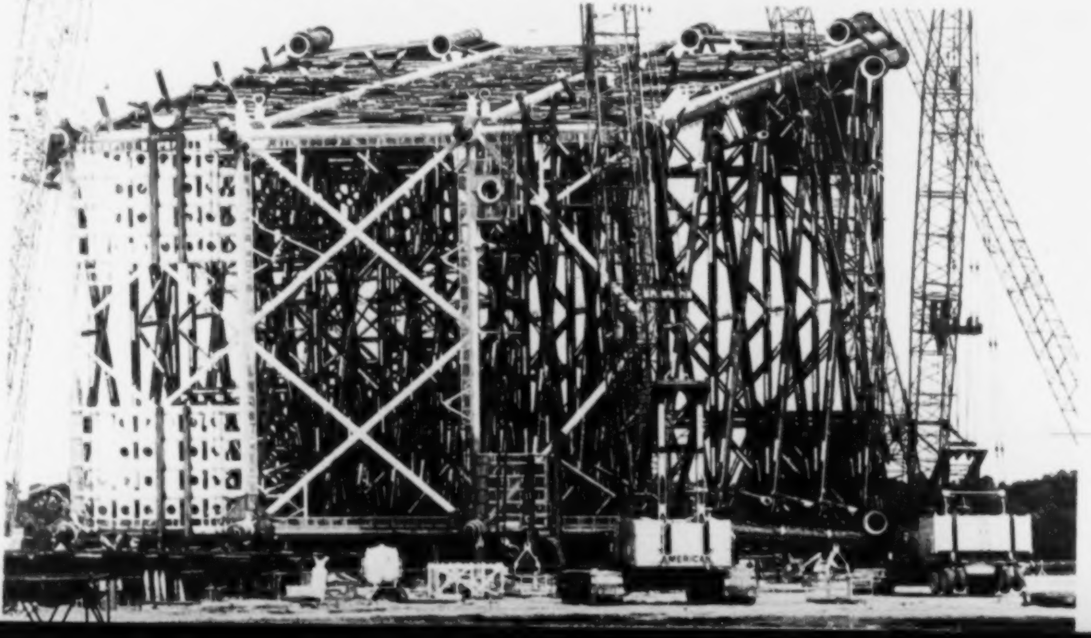
Increased Alaskan production partly offset the decline, but could not prevent it.

This year, increased output in California and a modest gain in crude prices and drilling activity will slow the rate of decline, but U.S. production will still fall by about 170,000 b/d.

Higher demand and lower production will mean U.S. dependence on imported crude and products this year will be the third highest year on record.

Marginally higher oil prices in 1989 will bring a small increase in U.S. drilling activity. And the expectation that gas markets will tighten could be a key to putting more rigs to work this year.

The recent OPEC accord establishing new production quotas had boosted U.S. crude oil wellhead prices at yearend. And as 1989 began, there were encouraging indications that discipline might be returning to the producer group. OPEC output during the first half of the year will have a critical influence on company investment decisions throughout 1989.



Drilling is under way and production is scheduled to begin this quarter from this platform installed last year by Standard Oil Production Co. in Ewing Bank Block 826 about 120 miles south of New Orleans.

U.S. energy demand

	1987 Trillion BTU	1988 Trillion BTU	% change 1988/87	1989 Trillion BTU	% change 1989/88	% share of market
Oil	32,865	33,720	+ 2.6	34,275	+1.6	42.1
Natural gas	17,668	18,420	+ 4.3	18,745	+1.8	23.0
Coal	18,008	18,670	+ 3.7	19,100	+2.3	23.5
Nuclear	4,916	5,830	+18.6	6,035	+3.5	7.4
Hydro & other	3,324	3,030	− 8.8	3,225	+6.4	4.0
Total	**76,781**	**79,670**	**+ 3.8**	**81,380**	**+2.1**	**100.0**

Source: 1987 DOE; 1988 and 1989 OGJ estimates.

U.S. natural gas supply and demand

	1986 bcf	1987 bcf	1988 bcf	% change 1988/87	1989 bcf	% change 1989/88
Production						
Texas	6,152	6,126	6,255	+2.1	6,300	+0.7
Louisiana	4,895	5,123	5,120	–	5,200	+1.6
Other states	5,744	6,100	6,235	+2.2	6,310	+1.2
Total production	**16,791**	**17,349**	**17,610**	**+1.5**	**17,810**	**+1.1**
Imports						
Canada	748	992	1,360	+37.1	1,470	+8.1
Mexico	0	0	0	–	0	–
LNG	2	0	0	–	0	–
Total imports	**750**	**992**	**1,360**	**+37.1**	**1,470**	**+8.1**
Supplemental gas	113	101	140	+38.6	150	+7.1
Losses, etc.	1,225	1,245	1,250	+0.4	1,250	–
Total new supply	**16,429**	**17,197**	**17,860**	**+3.9**	**18,180**	**+1.8**
Supply from storage	−147	−6	+65	–	+60	–
Total supply	**16,282**	**17,191**	**17,925**	**+4.3**	**18,240**	**+1.8**
Exports	61	54	60	+11.1	60	–
Total consumption	**16,221**	**17,137**	**17,865**	**+4.2**	**18,180**	**+1.8**

Extraction losses, and unaccounted for gas
Source: 1986 and 1987 DOE; 1988 and 1989 OGJ estimates

Following are highlights of Oil & Gas Journal's forecast for 1989:

- Total U.S. energy demand will increase 2.1% to 81.38 quadrillion BTU (quads); consumption of all major types of energy will increase. Hydroelectric, geothermal, and other sources will gain the most, 6.4%. Some of this gain is related to recovery from last year's drought. Nuclear energy will increase 3.5% after jumping 18.6% last year.
- U.S. petroleum product demand will reach the highest level since 1979, up 1.6% to 17.375 million b/d, following last year's healthy increase of 2.6%.
- U.S. crude and condensate production will continue to fall, declining 2.1% to 7.98 million b/d. Over the 4-year span 1985-89, production will be down 991,000 b/d, or 11.0%
- Total imports are expected to increase another 6.3% to 7.655 million b/d, representing 44.1% of U.S. demand.
- Input to refineries will move up along with demand, increasing 1.7% to 13.635 million b/d. Capacity is projected to remain at 15.92 million b/d, bringing the utilization rate to 85.6%.
- Natural gas consumption in the U.S. will grow by 1.8% to 18.18 tcf. Production will be up only 1.1% to 17.81 tcf and imports will fill the gap, increasing 8.1% to 1.47 tcf.

Healthy energy demand

Economic growth in the U.S. in 1988 was stronger than expected. Real gross national product (GNP) in constant 1982 dollars gained an estimated 3.9%, higher than any of the past 3 years. Increases in consumer spending, capital investment, and exports were key causes.

Moves to combat inflation should dampen the growth in capital investment and consumer spending this year, holding overall economic growth to about 2.3%. The rate of inflation picked up late in 1988, and is expected to be higher next year.

Growth in industrial production will also slow in 1989, falling to 3.2% from 5.4% in 1988. But because that growth rate will still be greater than for all economic activity, demand for energy will increase.

U.S. energy consumption per dollar of GNP has been relatively constant over the past 3 years, following 15 years of steady decline. In 1988, the ratio was 19,932 BTU/GNP dollar.

From 1985 to 1988, GNP has grown 10.4%, and energy consumption 7.7%. Between 1975 and 1985 GNP increased 34.3% while energy consumption increased only 4.8%. Energy consumption is expected to increase almost as fast as GNP in 1989, gaining 2.1% to 81.38 quads.

Oil energy consumption in the U.S. is projected to grow by 1.6% in 1989 to 34.275 quads. But oil's share of the energy market will slip to 42.1% from 42.3% in 1988 and 42.8% in 1987. Oil had regained some market share in 1986 when heavy fuel oil prices fell below natural gas prices and boosted demand. Natural gas had 24.1% of the market in 1985.

This slipped to 22.5% in 1986, and then rebounded to 23.1% in 1988. Natural gas consumption increased 4.3% in 1988 to 18.42 quads After the more modest growth expected in 1989—1.8% to 18.745 quads—gas' U.S. energy market share will slip to 23.0%.

One cause of increased energy demand is increased demand for electricity. In the utility market, natural gas will face stiff competition in 1989 from coal, and from increases in nuclear and hydro output.

Coal energy consumption increased 3.7% in 1988 to 18.67 quads, giving it 23.4% of the energy market. That will increase 2.3% to 19.1 quads, and 23.5% of the market in 1989.

Energy from nuclear power jumped 18.6% in 1988 to 5.83 quads, accounting for 7.3% of the U.S. energy market. The gain was a result of both increased capacity and a higher utilization rate for installed capacity.

Crude output worsens

U.S. crude production continued to slide in 1988, falling 2.4%—199,000 b/d—to 8.15 million b/d. Output is down 821,000 b/d since 1985.

As crude prices fell under the weight of worldwide overproduction, drilling activity remained depressed. The Baker Hughes rig count ended the year at the same level as last year, a modern-day low. Fewer new wells were completed, and operators shut in marginal wells.

Production in 1989 will slip another

OGJ forecast of U.S. supply and demand

(1,000 b/d)

	Year 1989	% change 89/88	Year* 1988	% change 88/87	–1st qtr. 1989–		–2nd qtr. 1989–		–3rd qtr. 1989–		–4th qtr. 1989–	
					Volume	% Change	Volume	% Change	Volume	% Change	Volume	% Change
DOMESTIC DEMAND												
Motor gasoline	7,405	+ 1.0	7,335	+ 1.8	7,050	+ 1.1	7,570	+ 1.0	7,540	+ 1.3	7,450	+ 0.5
Dist. 1-4	6,150	+ 0.9	6,094	+ 1.8	5,841	+ 1.1	6,303	+ 1.0	6,270	+ 1.3	6,186	+ 0.3
Dist. 5	1,255	+ 1.1	1,241	+ 2.1	1,219	+ 1.1	1,267	+ 1.0	1,270	+ 1.3	1,264	+ 1.2
Naphtha jet fuel	215	+ 0.9	213	+ 3.9	205	+ 1.5	225	+ 1.8	210	+ 1.0	220	+ 0.5
Dist. 1-4	152	+ 0.7	151	+ 5.6	139	+ 1.5	163	+ 1.9	149	+ 0.7	157	—
Dist. 5	63	+ 1.6	62	—	66	+ 1.5	62	+ 1.6	61	+ 1.7	63	+ 1.6
Kerosine jet fuel	1,285	+ 3.9	1,237	+ 4.7	1,325	+ 3.8	1,220	+ 3.9	1,260	+ 4.0	1,335	+ 3.9
Dist. 1-4	933	+ 3.8	899	+ 4.7	969	+ 3.7	896	+ 3.9	900	+ 3.9	967	+ 3.5
Dist. 5	352	+ 4.1	338	+ 5.0	356	+ 3.8	324	+ 3.8	360	+ 4.0	368	+ 4.8
Distillate	3,150	+ 2.1	3,085	+ 3.6	3,600	+ 2.2	2,875	+ 2.1	2,835	+ 2.3	3,290	+ 1.9
Dist. 1-4	2,721	+ 2.1	2,665	+ 2.8	3,176	+ 2.2	2,458	+ 2.1	2,391	+ 2.3	2,859	+ 1.9
Dist. 5	429	+ 2.1	420	+ 8.8	424	+ 2.2	417	+ 2.2	444	+ 2.3	431	+ 1.9
Residual	1,310	+ 0.4	1,305	+ 3.1	1,545	+ 0.5	1,110	+ 0.4	1,185	+ 0.3	1,400	+ 0.4
Dist. 1-4	1,065	+ 0.5	1,060	+ 4.0	1,281	+ 0.5	873	+ 0.6	957	+ 0.2	1,149	+ 0.6
Dist. 5	245		245	— 0.8	264	+ 0.4	237	— 0.4	228	+ 0.4	251	— 0.4
LPG and ethane	1,695	+ 2.1	1,660	+ 2.9	1,960	+ 2.1	1,370	+ 1.9	1,580	+ 2.2	1,870	+ 2.2
Dist. 1-4	1,608	+ 2.1	1,575	+ 2.9	1,864	+ 2.1	1,288	+ 1.9	1,503	+ 2.2	1,777	+ 2.2
Dist. 5	87	+ 2.4	85	+ 3.7	96	+ 2.1	82	+ 2.5	77	+ 2.7	93	+ 2.2
Other products	2,315	+ 2.0	2,270	+ 2.3	2,045	+ 2.1	2,425	+ 1.9	2,600	+ 1.9	2,190	+ 2.0
Dist. 1-4	1,955	+ 1.9	1,918	+ 1.0	1,698	+ 2.2	2,074	+ 1.9	2,211	+ 1.9	1,837	+ 1.8
Dist. 5	360	+ 2.3	352	+ 9.7	347	+ 2.1	351	+ 2.0	389	+ 1.8	353	+ 3.2
TOTAL DOMESTIC DEMAND	17,375	+ 1.6	**17,105**	**+ 2.6**	**17,740**	**+ 1.7**	**16,795**	**+ 1.6**	**17,210**	**+ 1.7**	**17,755**	**+ 1.3**
Dist. 1-4	14,584	+ 1.5	14,362	+ 2.4	14,968	+ 1.7	14,055	+ 1.6	14,381	+ 1.7	14,932	+ 1.2
Dist. 5	2,791	+ 1.7	2,743	+ 4.1	2,772	+ 1.7	2,740	+ 1.5	2,829	+ 1.8	2,823	+ 1.9
EXPORTS	810	—	**810**	**+ 5.9**	**865**	**— 0.1**	**815**	**+ 0.4**	**775**	**+ 0.1**	**785**	**— 0.4**
Dist. 1-4	370		370	+ 6.6	387	—	395	+ 0.5	346	+ 0.3	352	— 0.8
Dist. 5	440		440	+ 5.0	478	— 0.2	420	+ 0.2	429	—	433	—
TOTAL DEMAND	18,185	+ 1.5	**17,915**	**+ 2.8**	**18,605**	**+ 1.6**	**17,610**	**+ 1.5**	**17,985**	**+ 1.7**	**18,540**	**+ 1.3**
Dist. 1-4	14,954	+ 1.5	14,732	+ 2.5	15,355	+ 1.6	14,450	+ 1.5	14,727	+ 1.7	15,284	+ 1.2
Dist. 5	3,231	+ 1.5	3,183	+ 4.3	3,250	+ 1.4	3,160	+ 1.3	3,258	+ 1.6	3,256	+ 1.7
SUPPLY												
Crude & condensate	7,980	— 2.1	8,150	— 2.4	8,040	— 3.4	8,000	— 2.6	7,960	— 0.6	7,920	— 1.7
Dist. 1-4	4,850	— 3.9	5,047	— 4.7	4,900	— 5.4	4,865	— 4.9	4,830	— 2.1	4,805	— 3.0
Dist. 5	3,130	+ 0.9	3,103	+ 1.6	3,140	— 0.1	3,135	+ 1.4	3,130	+ 1.9	3,115	+ 0.3
NGL and other hydrocar.	1,670		1,670	+ 0.6	1,655	—	1,670	+ 0.1	1,685	+ 0.2	1,670	— 0.3
Dist. 1-4	1,569		1,569	+ 0.1	1,550	+ 0.2	1,570	—	1,585	+ 0.2	1,571	— 0.4
Dist. 5	101		101	+ 9.8	105	— 2.8	100	+ 2.0	100	—	99	+ 1.0
IMPORTS												
Crude	5,445	+ 8.3	5,030	+ 9.4	5,135	+10.3	5,300	+ 4.3	5,500	+ 9.4	5,845	+ 9.1
Dist. 1-4	5,250	+ 8.2	4,850	+10.3	4,991	+10.2	5,087	+ 4.3	5,316	+ 9.2	5,606	+ 9.4
Dist. 5	195	+ 8.3	180	— 9.1	144	+16.1	213	+ 4.9	184	+15.7	239	+ 2.1
Products and unfinished	2,210	+ 1.8	2,170	+ 8.2	2,250	+ 3.5	2,000	+ 4.6	2,150	+ 4.7	2,440	— 4.0
Dist. 1-4	2,133	+ 1.6	2,099	+ 9.4	2,190	+ 3.3	1,921	+ 4.4	2,066	+ 4.6	2,355	— 4.2
Dist. 5	77	+ 8.5	71	—17.4	60	+13.2	79	+ 9.7	84	+ 9.1	85	+ 3.7
TOTAL IMPORTS	7,655	+ 6.3	**7,200**	**+ 9.1**	**7,385**	**+ 8.2**	**7,300**	**+ 4.4**	**7,650**	**+ 8.1**	**8,285**	**+ 4.9**
Dist. 1-4	7,383	+ 6.2	6,949	+10.0	7,181	+ 8.0	7,008	+ 4.3	7,382	+ 7.9	7,961	+ 5.0
Dist. 5	272	+ 8.4	251	—11.3	204	+15.9	292	+ 6.2	268	+13.6	324	+ 2.5
Processing gain, loss, etc.	920	+ 1.7	905	+15.0	915	+ 0.2	990	+ 0.1	1,055	+ 0.1	720	+ 8.4
Dist. 1-4	712	+ 1.6	701	+17.2	751	— 0.3	735	— 0.4	764	— 0.1	598	+ 9.1
Dist. 5	208	+ 2.0	204	+ 7.9	164	+ 2.5	255	+ 1.6	291	+ 0.7	122	+ 5.2
TOTAL NEW SUPPLY	18,225	+ 1.7	**17,925**	**+ 3.0**	**17,995**	**+ 1.6**	**17,960**	**+ 0.6**	**18,350**	**+ 3.0**	**18,595**	**+ 1.6**
Dist. 1-4	14,514	+ 1.7	14,266	+ 3.5	14,382	+ 1.8	14,178	+ 0.2	14,561	+ 3.1	14,935	+ 1.9
Dist. 5	3,711	+ 1.4	3,659	+ 1.2	3,613	+ 0.7	3,782	+ 1.8	3,789	+ 2.5	3,660	+ 0.7
STOCK CHANGE	40	—	**10**	—	**(610)**	—	**350**	—	**365**	—	**55**	—
Dist. 1-4	(440)		(466)	—	(973)	—	(272)	—	(166)		(349)	—
Dist. 5	480		476	—	363	—	622	—	531		404	—
CRUDE RUNS TO STILLS	13,475	+ 1.7	**13,255**	**+ 3.1**	**13,135**	**+ 1.7**	**13,610**	**+ 1.7**	**13,815**	**+ 1.7**	**13,340**	**+ 1.7**
TOTAL INPUT TO STILLS	13,635	+ 1.7	**13,410**	**+ 3.2**	**13,295**	**+ 1.4**	**13,770**	**+ 1.6**	**13,975**	**+ 2.0**	**13,500**	**+ 1.7**
TOTAL REFINING CAPACITY	15,920		**15,917**	**+ 1.8**	**15,920**	**+ 0.2**	**15,920**	**+ 0.2**	**15,920**	**— 0.2**	**15,920**	—
REFINING UTILIZATION (%)	85.6	+ 1.7	**84.2**	**+ 1.4**	**83.5**	**+ 1.8**	**86.5**	**+ 1.8**	**87.8**	**+ 2.1**	**84.8**	+ 1.7
TOTAL INDUSTRY STOCKS†	1,085	+ 1.4	**1,070**	**+ 0.3**	**1,015**	**+ 0.1**	**1,046**	**— 1.4**	**1,079**	**+ 0.6**	**1,085**	**+ 1.4**
Products	730	+ 1.4	720	+ 0.3	680	+ 3.0	706	+ 0.6	729	2.1	730	+ 1.4
Crude	355	+ 1.4	350	+ 0.3	335	— 5.4	340	— 5.3	350	+ 6.7	355	+ 1.4
SPR stocks†	580	+ 3.6	560	+ 3.5	565	+ 3.7	570	+ 3.6	575	+ 3.6	580	+ 3.6

*Preliminary estimate. †Million bbl at end of period.

U.S. crude, product, and gas prices

Year	Crude oil		Products		Natural gas	
	Average U.S. wellhead price ($/bbl)	Average landed cost of imports ($/bbl)	Unleaded gasoline pump price (¢/gal)	No 2 fuel oil wholesale price (¢/gal)	Average U.S. wellhead price ($/Mcf)	Average consumer price ($/Mcf)
1976	8.19	13.34	61.4	N.A.	0.58	1.47
1977	8.57	14.31	65.6	N.A.	0.79	1.78
1978	9.00	14.38	67.0	36.9	0.91	1.98
1979	12.64	21.65	90.3	56.9	1.18	2.34
1980	21.59	33.95	124.5	80.3	1.59	2.91
1981	31.77	36.52	137.8	97.6	1.98	3.51
1982	28.52	33.18	129.6	91.4	2.46	4.32
1983	26.19	28.93	124.1	81.5	2.59	4.82
1984	25.88	28.46	121.2	82.1	2.66	4.85
1985	24.09	26.66	120.2	77.6	2.51	4.72
1986	12.51	13.49	92.7	48.6	1.94	4.13
1987	15.41	17.71	94.8	52.7	1.67	4.05
1988*	12.40	13.85	93.9	50.0	1.60	3.85

*Estimated.
Source: 1976-1987, DOE; 1988 OGJ estimates.

U.S. energy efficiency

Year	GNP (Billion 1982 dollars)	Energy consumption (Trillion BTU)	Energy consumption per GNP 1982 dollar (Thousand BTU)	Oil energy consumption (Trillion BTU)	Oil energy consumption per GNP 1982 dollar (Thousand BTU)
1970	2,416	67,143	27.8	29,537	12.2
1971	2,485	68,348	27.5	30,570	12.3
1972	2,609	71,643	27.5	32,966	12.6
1973	2,744	74,282	27.1	34,840	12.7
1974	2,729	72,543	26.6	33,455	12.3
1975	2,695	70,545	26.2	32,731	12.1
1976	2,827	74,362	26.3	35,175	12.4
1977	2,959	76,289	25.8	37,122	12.5
1978	3,115	78,089	25.1	37,965	12.2
1979	3,192	78,897	24.7	37,123	11.6
1980	3,187	75,955	23.8	34,202	10.7
1981	3,249	73,991	22.8	31,931	9.8
1982	3,166	70,848	22.4	30,231	9.5
1983	3,279	70,524	21.5	30,054	9.2
1984	3,501	74,101	21.2	31,051	8.9
1985	3,619	73,945	20.4	30,922	8.5
1986	3,722	74,237	20.0	32,196	8.7
1987	3,847	76,781	20.0	32,865	8.5
1988*	3,997	79,670	19.9	33,720	8.4
1989†	4,089	81,380	19.9	34,275	8.4

*Estimated. †Forecast.
Source: 1970-87, DOE; 1988 and 1989 OGJ estimates

2.1% to 7.98 million b/d, the lowest level since 1965.

Total liquids production dipped to 9.82 million b/d last year, the lowest since 1977 when Prudhoe Bay came on stream. Total liquids output will fall another 1.7% this year to 9.65 million b/d.

Production of natural gas liquids (NGL) and other hydrocarbons gained 10,000 b/d to 1.67 million b/d in 1988. No change is expected this year.

The 1988 drop in total U.S. production came despite record Alaskan output of 2.025 million b/d, up 63,000 b/d. Lower 48 production fell 4.1%, or 262,000 b/d, to 6.125 million b/d.

The decline this year is expected to be only slightly slower than 1988. Alaskan production will increase slightly to 2.04 million b/d; Lower 48 production will drop to 5.94 million b/d, the lowest level for the Lower 48 since 1950.

Demand will stay strong

Although the entire drop in crude prices did not pass through to product prices in 1988, the lower real cost of petroleum energy stimulated additional consumption and dampened conservation.

And the healthy margin meant very good profits for refiners.

Lower prices combined with strong economic growth to push domestic demand for petroleum products up 2.6% to 17.105 million b/d last year, and the same combination should again boost demand in 1989. Prices will increase though, and economic growth will be slower in 1989, so demand will only gain about 1.6%.

Demand in 1988 was higher for all major products. In 1989, demand for all products should be higher, but the growth in resid demand could be very slight.

Total demand including exports is projected to be up 1.5% to 18.185 million b/d. Exports are estimated to remain near the 1988 level of 810,000 b/d.

U.S. demand for petroleum products fell for 5 straight years from the record high of 18.847 million b/d in 1978 to 15.231 million b/d in 1983, a drop of 3.616 million b/d. Since 1983, demand has recaptured 51.8% of the loss.

Conservation and increased efficiency have lowered the amount of oil energy consumed per dollar of GNP from 12,545 BTU in 1977 to 8,436 BTU in 1988. This should drop marginally to 8,382 BTU in 1989.

Gasoline nears record. Demand for motor gasoline remained strong in the U.S. in 1988, increasing 1.8% to 7.335 million b/d. This was the second highest year on record, surpassed only by 1978 demand of 7.412 million b/d.

Further gains this year, estimated at 1.0% to 7.405 million b/d, will put demand near the record.

Demand has been growing in recent years despite increased automobile fuel efficiency. More than offsetting this has been a steady increase in the size of the vehicle fleet and an increase in the average miles driven per vehicle.

Miles driven increased further last year and will again in 1989.

Also, during the past 2 years, the 65 mph speed limit for interstate highways is estimated to have added as much as 90,000 b/d to consumption.

Gasoline prices did not drop along with crude prices. The average pump price for unleaded gasoline fell only marginally in 1988 to 93.9¢/gal from 94.8¢/gal in 1987. But the price remained well below the peak, and adjusted for inflation, was at a record low.

Total U.S. demand for jet fuel was up 4.6% in 1988 and is projected to increase 3.4% this year to 1.5 million b/d.

Most all of the increase will be in demand for kerosine jet fuel for commercial aviation, which gained 4.7% in 1988 and will move up another 3.9% in 1989 to 1.285 million b/d.

Demand for naphtha jet fuel for military jets was up 3.9% in 1988 at 213,000 b/d; this year's level should be about 215,000 b/d.

Distillate demand should follow economic activity in 1989, increasing 2.1% to 3.15 million b/d after a 3.6% increase last year. The bulk of the increase will be in demand for highway diesel.

U.S. production of crude oil and lease condensate

	1988*	1987	1986	1985	1984	1983	1982	1981	1980	1979	Cumulative 1859-1988
	1,000 b/d										1,000 bbl
District 1:											
Fla., N.Y., Pa., W. Va.	39	41	47	57	63	77	93	117	133	149	2,627,314
Total Dist. 1	**30**	**41**	**47**	**57**	**63**	**77**	**93**	**117**	**133**	**149**	**2,627,314**
District 2:											
Illinois	64	66	75	83	79	80	76	66	62	60	3,360,384
Indiana	10	10	13	14	15	15	15	13	14	11	512,588
Kansas	158	164	184	207	207	196	193	181	164	156	5,593,270
Kentucky	15	16	18	21	21	22	20	18	16	15	712,887
Michigan	65	71	70	75	83	87	86	89	92	93	1,066,367
Nebraska	16	17	19	19	18	17	19	18	17	17	435,704
North Dakota	109	113	125	139	144	139	129	124	110	84	969,626
Ohio	29	33	37	41	42	41	40	37	35	35	978,775
Oklahoma	353	368	409	446	460	435	435	422	410	393	13,107,402
Others†	7	7	6	7	8	7	7	7	4	4	36,842
Total Dist. 2	**826**	**865**	**956**	**1,052**	**1,077**	**1,039**	**1,020**	**975**	**924**	**868**	**26,773,845**
District 3:											
Alabama	56	56	58	59	54	51	55	57	61	52	404,985
Arkansas	37	39	43	52	51	52	52	50	50	52	1,629,454
Louisiana	1,201	1,320	1,404	1,393	1,408	1,314	1,256	1,231	1,283	1,355	20,688,881
Mississippi	74	77	82	84	90	86	91	94	98	105	1,958,388
New Mexico	192	198	207	215	216	206	195	196	206	217	4,144,628
Texas	2,065	2,137	2,300	2,435	2,472	2,473	2,535	2,589	2,762	2,776	51,929,468
Total Dist. 3	**3,625**	**3,827**	**4,094**	**4,238**	**4,291**	**4,182**	**4,184**	**4,217**	**4,370**	**4,557**	**80,755,804**
District 4:											
Colorado	84	79	80	83	79	80	84	83	81	89	1,530,871
Montana	65	69	74	82	81	80	85	84	81	82	1,274,324
Utah	93	98	107	112	95	81	61	71	68	75	965,665
Wyoming	315	315	332	352	339	324	324	358	345	361	5,656,033
Total Dist. 4	**557**	**561**	**593**	**629**	**594**	**565**	**554**	**596**	**575**	**607**	**9,426,893**
District 5:											
Alaska	2,025	1,962	1,867	1,826	1,722	1,713	1,696	1,609	1,617	1,402	7,727,308
California	1,069	1,084	1,115	1,161	1,126	1,109	1,099	1,055	975	966	22,026,197
Nevada	9	9	8	8	5	2	2	2	2	3	23,705
Others§	(s)	(s)	(s)	(s)	1	1	1	1	1	1	20,599
Total Dist. 5	**3,103**	**3,055**	**2,990**	**2,995**	**2,854**	**2,825**	**2,798**	**2,667**	**2,595**	**2,372**	**29,797,809**
U.S. total	**8,150**	**8,349**	**8,680**	**8,971**	**8,879**	**8,688**	**8,649**	**8,572**	**8,597**	**8,553**	**149,381,665**

(s) Less than 500 b/d.

*Preliminary. †Includes Missouri, South Dakota, and Tennessee. §Includes Arizona and Washington.

Supply and demand for crude in the U.S.

	1988*	1987	1986	1985	1984	1983	1982	1981	1980	1979
	1,000 b/d									
SUPPLY										
Crude imports†	5,082	4,674	4,178	3,201	3,426	3,330	3,488	4,396	5,263	6,519
Crude production	8,150	8,349	8,680	8,971	8,879	8,688	8,649	8,572	8,597	8,552
Unaccounted for crude	272	145	139	145	185	114	71	83	93	– 11
Total supply	**13,504**	**13,168**	**12,997**	**12,317**	**12,490**	**12,132**	**12,208**	**13,051**	**13,953**	**15,060**
DEMAND										
Crude refinery runs	13,255	12,854	12,716	12,002	12,044	11,685	11,774	12,470	13,481	14,648
Crude used directly and loss	37	34	49	61	65	66	62	63	28	29
Crude exports	163	151	154	204	181	164	236	228	287	235
Crude into SPR	52	79	48	118	195	234	175	336	45	67
Total demand	**13,507**	**13,118**	**12,967**	**12,385**	**12,485**	**12,149**	**12,247**	**13,097**	**13,841**	**14,979**
Crude stock change (industry)	3	50	30	– 68	5	– 17	– 39	– 46	112	81
Crude stocks (million bbl)										
Primary (industry)§	350	349	331	320	345	343	350	363	380	339
SPR	560	541	512	493	450	379	294	230	108	91

*Preliminary. †Includes imports for the Strategic Petroleum Reserve. §Includes Alaskan crude in transit as of 1980.

Crude imports by country of origin*

	1988†	1987	1986	1985	1984	1983	1982	1981	1980	1979
					1,000 b/d					
Algeria§	121	115	78	84	195	176	90	261	456	608
Angola	195	180	102	104	85	71	42	45	37	39
Australia	50	49	30	21	25	0	0	0	0	0
Canada	690	608	570	468	341	274	214	164	199	271
China	82	63	68	36	15	6	8	0	0	13
Colombia	97	115	57	0	0	0	0	0	0	0
Congo	39	16	20	16	33	18	1	3	7	2
Ecuador§	27	23	64	56	47	56	32	38	17	30
Gabon§	18	35	25	51	57	59	40	35	25	42
Indonesia§	180	262	297	292	304	315	226	318	314	380
Iran§	0	98	19	27	10	48	35	0	8	297
Iraq§	321	82	81	46	12	10	3	0	28	88
Kuwait§	79	70	28	4	24	7	2	0	27	5
Libya§	0	0	0	0	0	0	23	317	548	642
Malaysia	7	12	11	1	0	3	18	33	61	52
Mexico	680	602	621	715	659	766	645	469	507	435
Nigeria§	547	529	437	280	207	301	510	611	841	1,069
Norway	53	70	53	31	112	65	102	114	144	75
Oman	9	35	8	2	10	34	22	24	24	37
Saudi Arabia§	887	642	618	132	309	321	530	1,112	1,250	1,347
Trinidad & Tobago	73	75	93	98	87	83	92	102	115	123
United Arab Emirates§	28	56	38	35	90	18	81	77	172	281
United Kingdom	262	304	317	278	378	365	441	369	173	197
Venezuela§	478	488	416	306	253	164	155	147	156	293
Zaire	29	22	26	34	31	22	19	16	13	4
Others	130	123	102	85	141	146	158	140	141	189
Total imports	**5,082**	**4,674**	**4,178**	**3,201**	**3,426**	**3,329**	**3,486**	**4,396**	**5,263**	**6,519**
Total from OPEC	**2,658**	**2,004**	**2,113**	**1,320**	**1,512**	**1,477**	**1,696**	**2,922**	**3,864**	**5,112**

*Includes imports for the Strategic Petroleum Reserve. †Preliminary. §OPEC member.

Imports of refined products

	1988*	1987	1986	1985	1984	1983	1982	1981	1980	1979
					1,000 b/d					
Gasoline	405	384	326	381	299	247	197	157	140	181
Kerosine	15	17	13	8	12	11	13	7	10	9
Jet fuel–kerosine	85	64	48	30	47	29	23	31	49	55
Jet fuel–naphtha	5	3	9	9	14	1	5	7	31	22
Distillate	275	255	247	200	272	174	93	173	142	196
Residual	580	565	669	510	682	699	776	800	941	1,150
Unfinished oils	375	299	250	318	231	234	174	112	55	56
Other†	430	417	483	411	459	327	344	312	283	264
Total U.S.	**2,170**	**2,044**	**2,045**	**1,866**	**2,016**	**1,722**	**1,625**	**1,599**	**1,651**	**1,933**

*Preliminary. †Includes plant condensate.

Exports of refined products and crude

	1988*	1987	1986	1985	1984	1983	1982	1981	1980	1979
					1,000 b/d					
Gasoline	22	35	33	10	6	10	20	2	1	1
Distillate	72	66	100	67	51	64	74	5	3	4
Residual	200	186	147	197	191	185	209	118	34	9
Lubricants	25	23	23	15	15	16	16	19	23	24
Coke	235	213	238	187	194	195	156	138	137	146
Asphalt and road oil	1	1	1	0	1	1	1	—	1	—
LPG	42	38	42	62	48	73	65	42	21	15
Other refined products	53	51	47	38	36	31	38	43	39	39
Total refined products	650	613	631	577	542	575	579	367	259	238
Crude	160	151	154	204	181	164	236	228	287	234
Total exports	**810**	**764**	**785**	**781**	**723**	**739**	**815**	**595**	**546**	**472**

*Preliminary.

Offsetting this will be a slight drop in residential and commercial demand due to higher prices and conversions to natural gas.

Demand was helped last year by a drop in the wholesale price of No. 2 fuel oil, down 5.1% at 50¢/gal.

Resid demand did an about-face again in 1988, reacting to lower prices and increasing 3.1% to 1.305 million b/d. Resid prices fell along with crude oil prices and were 20% below year earlier levels.

Demand for resid should hold steady this year.

More imports

The gap between U.S. demand for petroleum products and U.S. liquids production will continue to widen in 1989. And crude oil and product imports will increase sharply to fill that gap.

Oil & Gas Journal projects total industry imports, excluding crude oil for the Strategic Petroleum Reserve (SPR), will be up 6.3% in 1989 to 7.655 million b/d. This follows a 9.1% increase last year when imports reached 7.2 million b/d.

Fig. 1

Crude output will fall again

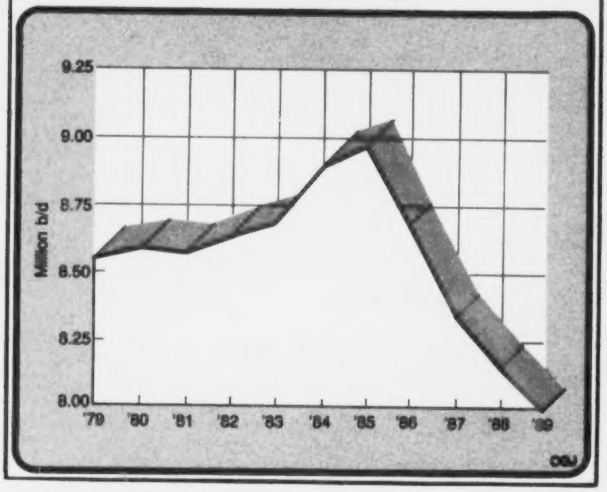


Fig. 2

Gasoline demand to gain

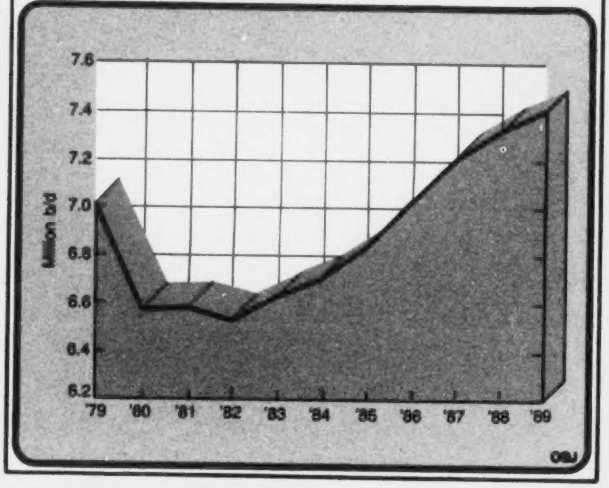


Fig. 3

Crude imports still rising

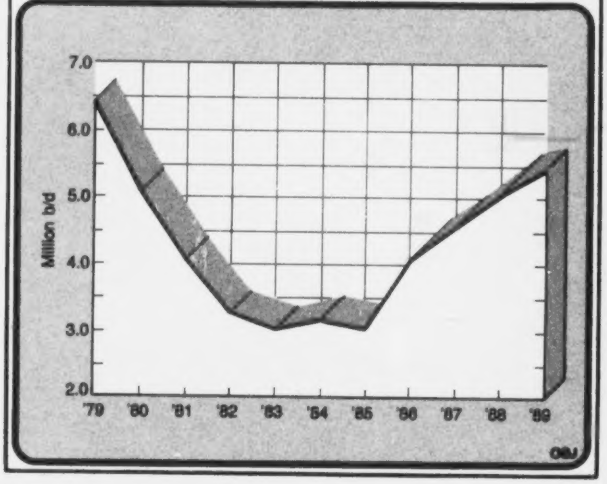


Fig. 4

Distillate demand up slightly

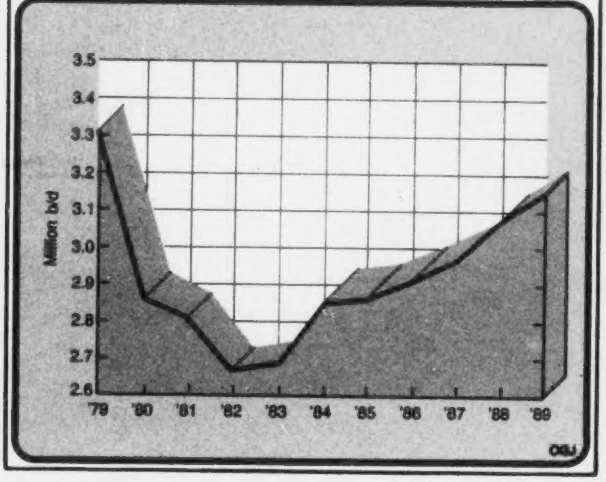


Fig. 5

Rig activity fall will reverse

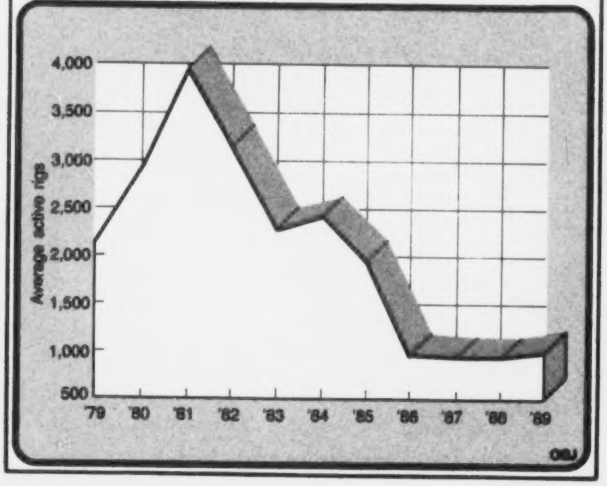
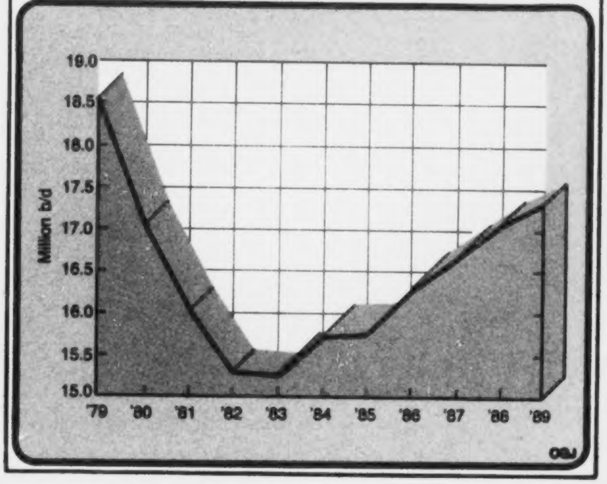


Fig. 6

Gain in total demand continues



Rotary rig activity by states

	1988	1987	1986	1985	1984	1983	1982	1981	1980	1979
Alabama	12.0	10.6	10.3	22.3	15.5	16.4	15.4	17.3	10.8	12.6
Alaska	12.1	8.5	12.8	20.0	14.0	13.8	21.6	23.5	13.8	13.5
Arizona	0.0	0.2	0.0	0.2	0.2	0.3	1.0	1.1	1.0	0.0
Arkansas	8.4	9.1	9.6	24.0	26.3	25.9	27.0	33.9	26.8	10.4
California	60.0	60.9	49.1	80.0	106.8	105.9	128.7	154.9	120.2	95.6
Land	52.9	54.6	43.8	68.3	88.8	83.7	106.2	133.7	104.7	85.7
Offshore	7.1	6.3	5.3	11.7	18.0	22.3	22.6	21.1	15.5	9.9
Colorado	28.7	24.8	24.3	49.8	53.9	52.3	60.3	81.6	61.1	40.2
Florida	1.4	2.8	2.2	6.7	3.7	4.4	4.6	7.8	4.1	5.3
Idaho	1.0	0.4	1.0	1.3	0.8	1.2	1.5	3.2	2.6	1.8
Illinois	3.9	3.4	5.6	28.4	41.5	60.5	75.5	44.6	25.4	13.1
Indiana	0.0	0.5	1.2	3.6	6.4	5.9	7.1	1.2	0.1	0.3
Kansas	40.0	48.5	46.8	91.4	127.1	124.5	157.4	196.2	120.2	62.5
Kentucky	5.1	2.0	2.5	6.3	7.9	8.3	9.5	5.3	1.7	0.5
Louisiana	163.2	134.7	142.1	282.2	309.9	282.3	342.8	455.6	427.4	347.0
North	13.9	11.4	11.3	24.5	30.1	29.6	39.6	58.0	54.9	34.5
Inland waters	25.0	22.9	41.8	85.4	96.1	81.6	107.8	83.2	76.6	62.1
South	36.7	35.4	20.2	43.4	51.2	47.3	59.2	160.3	156.4	112.3
Offshore	87.6	64.9	68.8	129.0	132.5	123.8	136.3	154.1	139.4	138.2
Michigan	19.5	21.8	24.0	33.5	34.0	29.2	31.4	36.5	30.7	25.1
Mississippi	17.5	13.1	15.3	30.8	32.0	32.8	41.6	71.5	57.6	40.2
Montana	7.8	8.5	9.7	22.7	36.0	23.8	36.2	81.4	49.2	32.9
Nebraska	2.9	5.2	3.1	6.4	8.9	9.0	9.4	15.1	14.3	9.2
Nevada	1.8	1.5	2.9	4.9	4.8	1.1	3.0	4.9	4.6	4.1
New Mexico	36.9	34.6	29.0	71.1	78.0	65.3	103.3	134.9	117.6	87.5
New York	1.1	2.0	2.2	4.8	8.8	10.3	15.2	11.6	7.0	8.7
North Dakota	14.5	14.1	13.3	38.3	50.9	42.3	69.4	118.8	83.4	56.5
Ohio	13.8	19.6	17.5	28.8	51.0	39.7	56.8	97.8	73.7	46.3
Oklahoma	125.3	136.1	141.2	251.3	319.1	285.4	621.5	698.4	397.3	246.8
Pennsylvania	18.7	17.4	17.9	29.5	35.2	22.1	32.6	38.6	29.0	28.9
South Dakota	0.7	0.4	0.6	1.7	2.1	1.0	1.5	2.2	1.9	1.4
Texas	280.3	293.0	310.9	676.6	849.5	797.0	989.5	1,315.8	987.7	770.2
Gulf Coast	36.8	42.4	44.5	101.3	137.9	134.3	168.4	305.0	210.5	141.3
Offshore & inland waters	25.4	19.8	21.7	51.5	59.8	56.3	88.4	74.4	72.1	50.3
North	28.5	23.8	36.5	86.9	124.4	125.0	138.1	170.6	147.2	122.5
Panhandle	15.1	16.8	16.0	37.2	49.6	48.4	66.2	66.5	50.8	48.1
East	37.6	36.2	45.4	77.2	101.8	102.2	116.5	163.7	119.8	107.1
West Central	43.9	44.8	41.7	81.8	99.7	102.6	139.4	191.4	140.4	109.4
West	93.0	109.3	105.1	240.7	276.4	228.2	272.5	344.3	247.1	191.7
Utah	6.1	7.4	11.1	28.5	45.5	36.7	39.8	69.2	42.4	28.9
West Virginia	12.6	12.6	15.0	26.1	37.9	34.2	49.4	44.8	37.8	29.8
Wyoming	36.8	39.3	35.4	92.1	114.5	95.8	142.7	191.3	155.5	147.2
Others	4.4	3.1	6.9	4.9	5.2	4.5	6.7	9.1	2.7	3.7
Total U.S.	**936.3**	**935.9**	**963.5**	**1,968.5**	**2,428.3**	**2,232.3**	**3,104.9**	**3,969.5**	**2,910.3**	**2,177.2**
Land	784.4	815.6	843.4	1,716.1	2,147.4	1,975.0	2,789.6	3,628.7	2,602.8	1,908.4
Inland waters	28.4	24.1	22.6	47.4	68.1	58.2	71.9	83.2	76.6	62.1
Offshore	123.5	96.2	99.7	205.0	212.8	199.1	243.4	257.6	230.9	206.8
Canada-land	194.4	179.3	174.8	302.1	242.8	189.5	195.0	258.7	396.4	334.6
Canada-offshore	2.5	2.0	4.1	9.1	13.5	10.4	5.4	4.8	4.7	4.1
Grand total	**1,133.2**	**1,117.1**	**1,142.5**	**2,279.7**	**2,684.6**	**2,432.2**	**3,305.3**	**4,232.9**	**3,311.4**	**2,515.9**

Source: Baker Hughes Inc. Note: May not add due to independent rounding.

Marketed natural gas production*

	1988†	1987	1986	1985	1984	1983	1982	1981	1980	1979
	MMcfd									
Alabama	351	321	294	294	278	249	205	217	178	235
Alaska	1,065	986	835	880	792	758	698	664	632	605
Arkansas	419	387	359	425	370	349	253	260	306	300
California	1,093	1,163	1,266	1,346	1,305	1,137	1,001	1,009	849	680
Colorado	539	451	448	488	474	448	576	527	523	523
Kansas	1,454	1,252	1,276	1,405	1,277	1,191	1,177	1,754	2,014	2,186
Louisiana	13,990	14,034	13,412	13,736	15,959	14,609	16,798	18,557	19,013	19,907
Michigan	409	403	349	361	395	381	419	418	433	438
Mississippi	378	383	386	395	433	414	554	570	508	395
New Mexico	2,286	2,257	1,925	2,480	2,623	2,453	2,732	3,078	3,150	3,237
Ohio	458	456	499	499	510	415	379	387	379	338
Oklahoma	5,470	5,493	5,253	5,305	5,440	4,739	5,300	5,531	5,183	5,028
Pennsylvania	450	447	438	412	454	324	332	335	266	264
Texas	17,090	16,784	16,854	16,583	16,945	16,270	17,802	19,205	19,868	19,657
W. Virginia	453	438	371	397	394	356	416	440	429	412
Wyoming	1,280	1,364	1,105	1,141	1,416	1,216	1,503	1,503	1,122	1,135
Others	930	910	932	970	879	779	594	218	597	437
Total	**48,115**	**47,530**	**46,002**	**47,118**	**49,944**	**46,088**	**50,739**	**54,673**	**55,450**	**55,777**
Volume change	585	1,528	(1,115)	(2,826)	3,856	(4,651)	(3,935)	(777)	(327)	1,341
Percent change	1.2	3.3	− 2.4	− 5.7	8.4	− 9.2	− 7.2	− 1.4	− 0.6	2.5
Imports	3,715	2,718	2,049	2,603	1,762	2,515	2,556	2,477	2,699	3,434
Exports	164	148	167	151	150	150	142	162	134	153

*Includes nonhydrocarbon gases. †Preliminary.

This will push U.S. dependency on foreign oil up to 44.1% this year, the highest level since 1979 and the third highest on record.

Most of the increase will be in crude imports (excluding SPR), forecast to be up 8.3% to 5.445 million b/d. Crude imports last year were up 9.4% at 5.03 million b/d.

Crude imports for the SPR are expected to continue at a pace close to the present level of 50,000-55,000 b/d.

Product imports jumped up 8.2% last year to 2.17 million b/d. Only a slight increase is expected this year, about 1.8% to 2.21 million b/d.

There was an increase last year in most of the major product categories. Product demand moved up more rapidly in 1988 than anticipated, and refiners used increased imports to satisfy product demand whenever profitable or necessary.

Gasoline imports were up 21,000 b/d to 405,000 b/d; distillate imports 20,000 b/d to 275,000 b/d; residual fuel imports 15,000 b/d to 580,000 b/d; and imports of unfinished oils were up 76,000 b/d at 375,000 b/d.

Good year for refining

U.S. refiners posted a very good year in 1988 with high margins, increased throughput, and higher utilization rates.

Operating margins benefited from feedstock costs that dropped almost 20% while product prices were down only marginally. The average U.S. wellhead price of crude oil dropped 19.5% to $12.40/bbl; the average landed cost of imports fell 21.8% to $13.85/bbl.

On the product side, the average pump price of unleaded gasoline fell only 0.9% to 93.9¢/gal and the average price of No. 2 fuel oil was down 5.1%.

In addition, crude runs moved up 3.1% to 13.255 million b/d while refining capacity was up only 1.8% to 15.917 million b/d. One result was an average refinery utilization rate of 84.2% compared with 83.0% the year before.

Crude runs are expected to be up along with demand this year, increasing 1.7% to 13.475 million b/d. Refining capacity will remain at the same level, resulting in a utilization rate of 85.6% for 1989.

Refining margins, however, may slip in 1989. The gains from higher throughput and utilization will be offset by higher crude feedstock costs. Product prices will also be up in 1989, but the increase will not match the increase in crude costs.

Refiners are likely to continue to hold stock levels close to the mini-

Demand for OPEC oil

	Estimate		Projection		
	3rd Qtr. 1988	4th Qtr. 1988	1st Qtr. 1989	2nd Qtr. 1989	3rd Qtr. 1989
	Million b/d				
Non-Communist demand	49.1	51.1	51.7	48.7	50.0
Non-OPEC supply	29.4	29.4	29.0	29.5	29.6
OPEC supply					
Crude oil	19.8	22.0	18.0	17.5	18.7
NGL	1.7	1.7	1.7	1.7	1.7
Total OPEC	21.5	23.7	19.7	19.2	20.4
Total supply	50.9	53.1	48.7	48.7	50.0
Stock change	+1.8	+2.0	−3.0	—	—

Source: Non-Communist demand, non-OPEC supply, OPEC supply 3rd qtr. 1988, and stock change 3rd qtr. 1988 IEA; Projections of OPEC supply 4th qtr. 1988, 1st qtr. and 2nd qtr. 1989 and stock change 4th qtr. 1988, 1st qtr. and 2nd qtr. 1989 Oil & Gas Journal.

Higher world demand, new OPEC quota are encouraging signs

The International Energy Agency (IEA) expects total non-Communist consumption of petroleum products to average 51.7 million b/d during the first quarter of 1989 and 48.7 million b/d for the second quarter. This is a gain of 1 million b/d from the same periods last year, an increase of 2.0%. IEA estimates that demand for liquids from other than non-OPEC sources—from stocks or from OPEC crude and NGL production—will be 22.7 million b/d during the first quarter, falling to 19.2 million b/d for the second quarter.

Assuming stock levels are cut at about 3 million b/d, demand for OPEC crude and NGL in the first quarter would fall to 19.7 million b/d. With OPEC NGL output averaging 1.7 million b/d, demand for OPEC crude oil is cut to 18 million b/d during the first quarter and 17.5 million b/d in the second quarter, assuming no more stock reduction in the second quarter.

Both of these quarterly production levels are below the new OPEC quota of 18.5 million b/d. So to keep prices at $16-17/bbl, OPEC must stay close to its production quota. To boost prices to the $18.00/bbl mark, production will have to be reduced to less than 18 million b/d. As the year began, there were signs most OPEC members were restricting output to near quota levels. But it will be difficult enough to maintain the quota, let alone reduce production further.

However, higher prices could be sustained during the first and second quarter even if OPEC modestly exceeds its quota. Non-Communist demand for petroleum products may be considerably higher than now estimated by IEA. Industry analysts are surprised that industry stock levels have not increased substantially as a result of excess OPEC production in 1988. U.S. stocks at the end of the year were at about the same level as a year earlier.

Some feel this indicates non-Communist demand growth has been far greater than estimated.

OPEC production. Especially during the last half of the year, many OPEC members exceeded their production quota in 1988.

The cartel's production increased from 17.5 million b/d during the first quarter, to 18.6 million b/d in the second quarter, 19.8 million b/d in the third quarter. Output reached an estimated 21-22 million b/d in the fourth quarter. This made a shambles of the previous OPEC quota of 16.6 million b/d, adopted in July 1987, and placed far more crude on the market than was needed to satisfy demand.

The result was heavy downward pressure on worldwide crude prices throughout the year. According to the U.S. Energy Information Administration (EIA), the average world price of export crude fell from $16.35/bbl in January 1988 to $12.43/bbl in September. When OPEC jumped production over 21 million b/d in October, the price fell to $11.05/bbl for the month, and was as low as $10.13/bbl during the first week of October.

After the new production quota was agreed to, prices firmed a bit and averaged $13.00/bbl in December. Prices on the futures exchange climbed over $17/bbl at year end in anticipation that the OPEC agreement would restrain output sufficiently.

Refinery runs by districts

	1988 Crude runs* (1,000 b/d)	1988 Input to crude stills* (1,000 b/d)	1988 % of operable capacity	Crude runs 1987 (1,000 b/d)	1986	1985	1984	1983	1982	1981	1980	1979
East Coast	1,195	1,203	88.8	1,153	1,122	1,061	1,019	960	1,103	1,202	1,300	1,478
Appalachian Dist. 1	97	98	90.2	98	101	92	87	77	93	132	158	167
Total Dist. 1	**1,292**	**1,301**	**88.9**	**1,251**	**1,223**	**1,153**	**1,106**	**1,037**	**1,196**	**1,334**	**1,458**	**1,645**
Ill., Ind., Ky.†	1,944	1,950	86.9	1,929	1,901	1,837	1,842	1,851	1,765	1,857	2,121	2,418
Minn., Wisc., Daks.	304	308	96.7	287	294	285	282	253	251	229	238	294
Okla., Kan., Mo.	662	666	90.7	627	627	617	636	642	763	883	945	1,017
Total Dist. 2	**2,910**	**2,924**	**88.7**	**2,844**	**2,822**	**2,739**	**2,760**	**2,746**	**2,779**	**2,969**	**3,304**	**3,729**
Texas:												
Inland	474	477	81.5	470	472	472	499	474	456	469	445	472
Gulf Coast	3,026	3,059	85.5	2,909	2,990	2,750	2,780	2,801	2,726	2,829	3,151	3,462
Louisiana Gulf	2,243	2,280	77.2	2,229	2,162	1,972	2,012	1,862	1,941	2,030	2,091	2,167
N. La., Ark.	172	174	68.2	164	170	168	177	170	162	163	186	200
New Mexico	68	69	91.4	66	63	60	68	75	77	81	87	89
Total Dist. 3	**5,983**	**6,059**	**81.4**	**5,839**	**5,857**	**5,422**	**5,536**	**5,382**	**5,362**	**5,572**	**5,960**	**6,390**
Total Dist. 4	**458**	**461**	**85.9**	**437**	**431**	**432**	**436**	**420**	**416**	**425**	**442**	**477**
Total Dist. 5	**2,612**	**2,665**	**84.0**	**2,483**	**2,383**	**2,256**	**2,206**	**2,100**	**2,021**	**2,171**	**2,354**	**2,405**
Total U.S.	**13,255**	**13,410**	**84.2**	**12,854**	**12,715**	**12,002**	**12,044**	**11,685**	**11,774**	**12,471**	**13,518**	**14,646**

*Preliminary. †Includes Appalachian Dist. 2.

U.S. refined products, natural gas liquids, and crude stocks

	1988* (1,000 bbl)	1987	1986	1985	1984	1983	1982§	1981	1980	1979
Gasoline	225,300	228,514	235,490	225,148	246,307	225,042	247,085	256,425	264,011	240,159
Motor†	223,000	226,183	233,057	222,839	243,296	222,434	244,279	253,001	261,327	237,503
Aviation†	2,300	2,331	2,433	2,309	3,011	2,608	2,806	3,424	2,684	2,656
Special naphthas	3,600	3,654	3,759	3,909	2,951	3,153	3,474	3,965	4,929	4,196
Kerosine	8,500	8,447	8,379	7,502	11,893	7,861	10,792	11,042	11,568	15,821
Distillate	124,100	134,485	155,097	143,673	161,072	140,263	185,579	191,541	205,113	228,706
Residual	44,200	47,410	47,437	50,381	53,000	48,504	68,229	77,992	91,786	95,859
Kerosine jet fuel	37,500	41,973	42,677	33,825	35,118	32,346	32,001	34,011	35,723	32,926
Naphtha jet fuel	6,600	7,956	7,072	7,502	6,861	6,265	7,189	7,054	6,308	5,594
Natural gas liquids & LRG	107,200	104,119	109,532	81,707	108,446	116,817	114,497	150,170	137,460	125,597
Unfinished oils	111,500	93,185	94,022	106,656	93,506	108,018	105,277	111,348	123,938	117,652
Other refined products	51,500	48,065	46,258	44,258	41,192	42,429	44,023	46,295	45,426	45,274
Total products stocks	**720,000**	**717,806**	**749,723**	**704,561**	**760,346**	**730,698**	**818,146**	**889,843**	**926,262**	**911,784**
Crude stocks (ex. SPR).	**350,000**	**348,995**	**331,224**	**320,892**	**345,376**	**343,850**	**350,044**	**363,464**	**358,166**	**339,080**
Total stocks (ex. SPR)	**1,070,000**	**1,066,803**	**1,080,947**	**1,025,453**	**1,105,722**	**1,074,548**	**1,168,190**	**1,253,307**	**1,284,428**	**1,250,864**
SPR stocks	**560,000**	**540,646**	**511,565**	**493,316**	**450,505**	**379,089**	**293,827**	**230,341**	**107,800**	**91,191**
Total stocks (incl. SPR)	**1,630,000**	**1,607,451**	**1,592,512**	**1,518,769**	**1,556,227**	**1,453,637**	**1,462,017**	**1,483,648**	**1,392,228**	**1,342,055**

*Preliminary. †Includes blending components. §Change in Energy Information Administration reporting basis.

mum for efficient operations. Total industry stocks are projected to move up only 1.4% this year to 1.085 billion bbl by year end.

Crude stocks will increase by 5 million bbl this year to 355 million bbl. Higher crude stocks give refiners more flexibility to meet changing demand patterns. Products stocks will also be up, increasing 10 million bbl to 730 million bbl. Increased demand will require somewhat higher product stocks.

The promise of gas

Consumption of natural gas in the U.S. is expected to increase in 1989 by about 1.8% to 18.18 tcf.

Rising natural gas prices and increased competition from other fuels resulted in a drop in consumption from 20.241 tcf in 1979 to 16.221 tcf in 1986, the lowest level since 1965.

Lower gas prices, more aggressive marketing, and higher energy demand to fuel economic growth have boosted natural gas consumption the past 2 years.

Demand jumped up 5.6% to 17.137 tcf in 1987, and then 4.2% to 17.865 tcf last year.

U.S. domestic marketed production of natural gas has not risen as rapidly as consumption. Marketed production was up 1.5% last year at 17.61 tcf. It is expected to increase an additional 1.1% this year to 17.81 tcf.

Imports were up 37.1% last year at 1.36 tcf, all from Canada. Imports are expected to be up 8.1% this year at 1.47 tcf.

Natural gas prices did not peak until 3 years after oil prices, and then did not fall as rapidly as crude prices. Gas prices fell to $1.67/Mcf in 1987, and dropped further to $1.60/Mcf in 1988.

This year, prices are expected to be in the $1.65-1.70/Mcf range. ▪

U.S. drilling slips further in '88; should reverse this year

John C. McCaslin
Exploration Editor

Oil prices slumped again in 1988, causing the industry to drill fewer wells in the U.S. during the year than had been forecast.

U.S. natural gas prices did increase during the last half of the year and confidence grew in further gains. But even though gas well drilling showed strength relative to oil completions, it was not enough to rescue another dismal drilling year.

The result was that an estimated 34,579 wells were drilled in the U.S. in 1988, down from the 38,000 forecast last July. Oil & Gas Journal's projection is for a slight upturn in completions this year, with a corresponding increase in footage drilled.

Major oil companies also drilled fewer wells in 1988 than had been planned. Fourteen major operators drilled 6,103 wells last year, and plan to complete only 5,894 wells in 1989. Only 14 majors responded to the Journal's survey compared to 16 who had reported previously.

Cost cutting and reorganization during the past 4 years have put many companies in vastly better financial condition, and there still seems to be confidence that profit is possible at prices expected in 1989. This confidence is reflected in the Journal's estimate of an increase in the share of revenue that operators will invest in drilling and exploration during 1989.

Despite the slight reduction in the number of wells planned by the major companies in the Journal group, marginally higher oil prices and the prospect of tightening natural gas markets will encourage independent operators to drill more wells this year, nudging the average active rig count higher. Independents traditionally drill the bulk of the wells in the U.S.

Though the majors plan to drill fewer wells onshore in the U.S. Lower 48 next year, they expect to increase drilling offshore and in Alaska.

There is a dark cloud on the exploratory scene. A fall of 22% from a year ago brought the November U.S. seismic crew count to 155, as tallied by the Society of Exploration Geophysicists. There was no change in the marine seismic vessel count; the drop of 43 was in the land crew count, hinting strongly that onshore exploration will continue to sag.

Completions in Western Canada are expected to fall sharply this year. Low oil prices and the removal of government incentives will cause the cutback in Canadian drilling activity and spending plans. The number of active rigs in Canada has slumped to 120 at the end of last year compared with 188 at the end of 1987.

All in all, 1989 will be a tough year for drilling and service rig contractors in Canada, as well as the rest of the service and supply sector. Basic exploration and geophysical work is expected to be slow, according to industry watchers in Calgary.

Here's how 1989 looks at the onset:

- The U.S. active rotary rig count will average 1,000, up 7% from an average of 936 last year.
- Operators will drill about 36,500 wells in the U.S., about a 6% increase over the estimated 34,579 wells drilled in 1988.
- Exploratory drilling will fall slightly to 5,678 wildcats.
- Footage drilled in the U.S. will reach 170 million ft in 1989. Average well depth will be 4,658 ft compared to 4,702 ft in 1988.
- Major operators plan to drill only 5,894 wells in 1989, including 565 wildcats.
- Drilling in western Canada will see 6,600 wells drilled in 1989, down sharply from 8,300 in 1988.
- Outside the U.S. and Canada, cumulative rig count average for 1988 was about 1,025; a small gain to an average of 1,050 is projected in 1989.

Regional highlights

On the West Coast, California's thermal enhanced oil recovery operations are weathering the damage of depressed oil prices.

As a result of these projects and conventional drilling plans, 3,600 wells are expected to be drilled in the state this year. Of this total, the major operators plan 1,787 wells.

Texaco U.S.A. Inc. has completed discoveries off Alabama and Louisiana, and in the Williston basin, and has an important gas development well in the Arkoma basin. Texaco's 1 Mobile Block 872, in 37 ft of water in Mobile Bay, flowed gas from the Jurassic Norphlet sand with total depth at 22,803 ft. The company is also testing 1 Garden Banks Block 189 in 720 ft of water off Louisiana; large oil flows were reported. The company also has a discovery 10 miles east of Williston in North Dakota in the Mississippian Mission Canyon.

The industry is expected to drill 250 wells in Alabama this year, 12 by majors. There will be 702 wells drilled in offshore Louisiana waters, up considerably over the 1988 figure. Majors will drill 393 of these.

U.S. offshore explorationists are moving into the ultradeep water of the Gulf of Mexico. The trend continued recently in the eastern gulf by way of Sale 116—the third area-wide lease sale held this decade in the eastern gulf and the first since 1985. Of the 115 blocks that received bids, 70% are in water deeper than 3,000 ft.

Development projects in the gulf are planned by Huffco, Conoco, Samedan, Chevron, and others. Amerada Hess plans to set platforms this year on South Timbalier Blocks 205 and 206 to develop a major natural gas discovery. TXO plans to set a platform on Texas Lease 90621 to develop Matagorda Island Block 487 gas field. The industry plans 200 offshore Texas completions this year. A recent important gas discovery in the deep Michigan play is Northern Michigan Exploration Co.'s Mecosta County strike, 1-19 Hudson. The operator reported gas in the Cambro-Ordovician Prairie du Chien and Silurian Burnt Bluff Clinton formations.

Industry plans 650 wells in Michigan this year, 157 to be drilled by the majors. Both Silurian reefs and the deep pays are on the agenda.

Waterfloods are still hot. First phase drilling at a waterflood in Levelland field, Hockley County, West Texas, has been completed. Parker & Parsley of Midland raised production from the field by about 700 b/d of oil and 550 Mcfd of gas with the drilling of 24 producing wells in the first phase of the program. More work will follow.

The industry expects to drill 1,950 wells in Texas Railroad Commission District 8 this year, 1,200 in 8A, and 610 in 7C. Majors are big in this area with 1,098 wells planned in all of West Texas this year. Many of these wells will be in flood projects. There were 1,395 wells drilled in the area last year by the 14 leading majors.

A typical find is Amoco Production Co.'s deeper pool wildcat discovery in shallow Slaughter San Andres Permian field, Cochran County. The 1 Dean pumped 333 b/d of oil from

Drilling outside U.S., Canada will gain slightly in 1989

Rig activity outside the U.S. and Canada maintained a relatively steady pace throughout last year, ranging between 1,017 and 1,037 rigs. The November count showed 740 land and 273 offshore rigs working for a total of 1,013. Average for the year was about 1,025 rigs, compared with 981 for 1987.

The Journal estimates that drilling activity outside the U.S. and Canada will gain slightly this year, averaging about 1,050 rigs for the year.

November was the first month in 1988 that the number of rigs operating was below the same month a year earlier. But activity began to pick up in the fall of 1987, reaching 1,051 rigs in December, then dropping back to 1,020-1,030.

In November of last year, the number of operating rigs in Latin America and Europe was below the level at the same time in 1987. But the rig count was ahead of the same month a year earlier in Africa, the Asia-Pacific region, and in the Middle East.

Crude prices will continue to influence activity in all regions in the year ahead. But the U.S. and Canada are subject to the widest and most frequent fluctuations.

Elsewhere, lead times are longer, especially in the case of offshore development projects and remote area drilling. And meeting domestic petroleum demand or developing export markets may override short term economics.

Regional highlights

In three regions that have shown strong drilling activity in recent months—Africa, the Asia-Pacific region, and the Middle East—1989 also promises to be a busy year.

A variety of projects involving exploration and development, both onshore and offshore, is responsible for the strength.

Middle East. Development of new oil and gas finds in Syria, coupled with exploration of new concessions will keep rigs active there this year. The Omar field, discovered early last year by a group led by Shell Pecten, is an example of the country's oil prospects. Gas discoveries will also bring more drilling this year. Earlier, Tricentrol planned to drill its first wildcat on its Abdul Azziz concession, and Total Syrie planned to drill two wells during 1989 on its concession (OGJ, June 20, 1988, p. 34).

Egypt's Western Desert has become increasingly active and licensing awards have attracted some new operators. British Petroleum, through its acquisition of Britoil plc, has the West Natrun concession which requires that five wells be drilled during the agreement's 7-year term. And Shell Winning earlier in the year planned to have two drilling rigs working in the Western Desert until 1991.

Exploration agreements signed last year covering acreage in the Gulf of Suez also commit operators to drilling programs during the next 3-6 years (OGJ Feb. 15, 1988, p. 28).

Asia-Pacific. In Australia, offshore exploratory drilling is a bright spot. Last year's activity was considerably above the year before, and six rigs at work at mid-1988 were expected to remain under contract at least through 1989. Operators are committed to drill 24 wells in 1989 on work program permits.

And officials last year expected companies to do additional drilling beyond commitment wells (OGJ, Aug. 8, 1988, p. 24).

The Timor Sea off Australia's northwest coast will continue to be an active area. BHP Petroleum Pty. Ltd. said last fall that it expected to drill as many wells in the next 12 months as it had in the previous 6 years. Plans were to use four rigs to drill 25-26 wells for BHP and its partners in various permits.

Recent discoveries in the Cauvery basin have boosted activity along India's southeastern coast. The Oil and Natural Gas Commission has identified 74 structures in the basin, 46 onshore and 28 offshore. Under an agreement with ONGC, the Soviets will drill 40 wells in an area of the Ariyalur-Pondicherry-Chi-dambaram subbasin (OGJ, Oct. 24, 1988, p. 90).

ONGC plans to boost the Cauvery rig count to 22 onshore and 3 offshore by yearend 1995, compared with 7 onshore rigs and 2 offshore rigs at work last fall.

Africa. In Gabon, a group led by Petrofina Exploratie Gabon BV acquired an exploration concession last year about 38 miles north of the Rabi discoveries. The 914-sq mile Alombie block was awarded as part of Gabon's third licensing round (OGJ, June 27, 1988, p. 78).

In Nigeria, development of the Edop field continued last year. Operated by Mobil in a joint venture with Nigerian National Petroleum Corp., it is expected to reach a peak production of 150,000 b/d. Early last year, three wells were capable of producing about 20,000 b/d, and plans called for installing five additional wellhead platforms and drilling 30-40 wells (OGJ, Mar. 21, 1988, p. 20).

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perforations at 11,482 ft.

Oklahoma, one of the more mature onshore U.S. producing areas, suddenly is being discussed as an oil and gas province of renewed productive value. Drilling in Cambro-Ordovician Arbuckle limestone in three areas has thrust the state back into the exploratory arena in a big way.

The three areas are Cottonwood Creek field in the Ardmore-Marietta basin, Carter County; ARCO's Wilburton field gas zone discovery in the Arkoma basin, Latimer County; and Northeast Mayfield field in the Anadarko basin, Beckham County.

There is also new life in the Red Oak-Norris District of the Arkoma basin with new gas flows in the Red Oak sands. High pressure gas flows are also being reported in Morrow wells in the Anadarko basin.

Oklahoma operators plan to drill 5,895 wells in 1989, up considerably over last year. The majors will drill 242 of these.

Exploratory and development programs are expanding in western and southwestern Kansas. Deep Mississippian and Pennsylvanian zones are the targets in this interesting new development. Kansas operators plan 2,800 wells this year, 140 by the majors.

A profitable oil play has developed along the Kansas-Colorado state line in recent months where Morrow discoveries have been popping up. Colorado operators plan to drill 800 wells this year. There will be considerable development and wildcatting work in the southeastern portion of the state along the Las Animas arch as a result of the Morrow success in the Arapahoe-Frontera area.

Sligo/Hosston action has returned to the Hinds County area of Mississippi. Zilkha Energy Co. has good gas flows from both zones at a well in this area. Operators expect to drill 400 wells in the state this year, 13 by the majors. A significant gas discovery in Fayette County, Ala., renewed the never lagging interest in the Black Warrior basin recently.

Oil & Gas Journal well forecast for 1989

State	1988 estimate			1989 forecast			
	Total Wells	Total wildcats	Total footage (1,000 ft)	Total wells	Total wildcats	Field wells	Total footage (1,000 ft)
Alabama	250	96	1,456	250	100	150	1,300
Alaska	140	5	1,275	170	10	160	1,667
Arizona	3	3	11	3	3	0	11
Arkansas	447	75	1,889	400	75	325	1,468
California	3,400	129	8,160	3,600	200	3,400	8,531
Colorado	1,000	360	5,957	800	200	600	4,400
Florida	10	10	136	20	10	10	260
Georgia	3	3	14	0	0	0	0
Idaho	2	2	11	2	2	0	11
Illinois	1,100	175	2,443	1,000	150	850	2,221
Indiana	250	72	418	400	90	310	600
Iowa	2	2	7	2	2	0	7
Kansas	2,700	900	9,118	2,800	950	1,850	7,000
Kentucky	900	150	1,548	900	100	800	1,548
Louisiana	2,300	410	17,286	2,362	470	1,892	18,645
North	1,000	120	4,421	800	120	680	3,280
South	700	90	7,029	860	130	730	8,365
Offshore	600	200	5,836	702	220	482	7,000
Maryland	1	1	4	0	0	0	0
Michigan	600	255	2,700	650	280	370	2,925
Mississippi	380	134	3,150	400	135	265	3,315
Missouri	18	7	49	18	7	11	49
Montana	325	130	1,330	350	100	250	1,357
Nebraska	180	95	964	180	95	85	964
Nevada	17	16	88	20	15	5	104
New Mexico	1,156	100	6,172	1,200	100	1,100	6,407
New York	250	10	624	250	15	235	646
North Dakota	260	130	2,203	250	100	150	2,119
Ohio	500	24	2,254	500	20	480	2,254
Oklahoma	4,000	250	21,000	5,895	275	5,620	30,475
Oregon	12	8	51	20	20	0	84
Pennsylvania	500	36	2,142	500	40	460	2,100
South Dakota	19	10	61	20	8	12	54
Tennessee	112	16	221	211	50	161	327
Texas	11,790	2,232	59,108	11,625	1,919	9,706	59,569
District 1	1,250	165	5,031	1,385	165	1,220	3,191
District 2	510	200	2,805	500	200	300	3,262
District 3	850	300	5,100	820	180	640	5,110
District 4	810	280	4,050	850	180	670	5,100
District 5	260	65	1,300	360	50	310	2,251
District 6	500	100	2,500	400	100	300	2,520
District 7-B	1,400	289	4,458	1,500	300	1,200	4,542
District 7-C	700	143	4,174	610	120	490	3,085
District 8	1,900	130	11,400	1,950	130	1,820	13,770
District 8-A	1,810	171	10,050	1,200	119	1,081	7,256
District 9	1,200	219	3,600	1,500	210	1,290	5,300
District 10	400	45	2,558	350	40	310	2,100
Offshore	200	125	2,082	200	125	75	2,082
Utah	140	48	799	100	20	80	500
Virginia	21	3	91	1	1	0	4
Washington	1	1	8	1	1	0	8
West Virginia	1,000	18	4,131	800	15	785	3,280
Wyoming	790	130	5,570	800	100	700	5,790
Total	**34,579**	**6,046**	**162,449**	36,500	**5,678**	**30,822**	**170,000**
Western Canada	8,300	2,794	30,808	6,600	2,232	4,368	25,983
Alberta	5,916	2,200	25,545	5,800	2,000	3,800	23,084
Saskatchewan	2,100	500	5,773	518	140	378	1,423
British Columbia	190	60	1,160	190	60	130	1,160
Manitoba	80	20	233	80	20	60	233
North—arctic	14	14	97	12	12	0	83
East Coast offshore	6	6	68	5	5	—	56

Two new Smackover finds plus an excellent extension promise more work in southwestern Alabama. Florida operators expect 20 wells to be drilled this year, 8 by the majors.

The East Texas basin is poised for a drilling revival. Gas will fuel the play. Most drilling involves Jurassic Cotton Valley tight gas field infill work. East Texas operators plan 760 wells this year, 164 by the majors.

Meridian Oil Co. plans five new horizontal wells in the Williston basin in the near future. The industry plans 250 wells to be drilled this year overall in North Dakota. Montana looks for 350 wells in 1989.

Unocal will drill a deep 13,150 ft wildcat in the Val Verde basin of Southwest Texas. The industry plans 1,385 wells in Texas Railroad Commission District 1, 500 in District 2, 820 in District 3, and 850 in District 4. Majors will drill 317 of these.

Confirmation to the Austin Creek Cretaceous Muddy field discovery in Natrona County, Wyo., highlights recent success in that state. The industry expects to drill 800 wells in the area this year. Many of these will be in the Wind River and Powder River basins. Majors will drill 267 wells in Wyoming this year.

Nevada can now boast eight active, officially designated oil fields. There were 17 wells drilled in the state last year and 20 are planned for 1989, 4 of these by the majors.

The majors will drill 170 wells in Alaska this year, 10 of these wildcats. The industry expects 400 wells to be drilled in Arkansas in 1989, 1,000 in Illinois, 400 in Indiana, 900 in Kentucky, 800 in North Louisiana, 860 in South Louisiana, 180 in Nebraska, 1,200 in New Mexico where new interest is centered in the San Juan basin, and 500 wells in Ohio.

There will be 250 wells drilled in New York state, 500 in Pennsylvania, and 800 in West Virginia. •

The majors' score

	Forecast		Wells drilled	
State	Total wells 1989	Wildcats 1989	Total wells 1988	Wildcats 1988
Alabama	12	7	165	11
Alaska	170	10	140	5
Arkansas	17	10	15	10
California	1,787	29	1,784	15
Colorado	264	9	124	15
Florida	8	7	4	3
Idaho	0	0	1	1
Illinois	125	0	119	0
Kansas	140	10	169	3
Kentucky	13	4	10	1
Louisiana	593	169	551	204
North	48	11	37	9
South	152	39	158	41
Offshore	393	119	356	154
Michigan	157	29	180	31
Mississippi	13	2	28	11
Montana	43	5	64	17
Nebraska	8	5	12	10
Nevada	4	1	5	4
New Mexico	86	14	127	20
North Dakota	31	13	27	12
Oklahoma	242	42	244	24
Oregon	14	14	13	0
Pennsylvania	106	1	99	0
Texas	1,714	125	2,009	147
South	317	55	322	57
Offshore	87	40	71	35
East	164	4	171	6
West	1,098	24	1,395	47
North	30	0	38	0
Panhandle	18	2	12	2
Utah	19	9	29	9
Virginia	1	1	0	0
Washington	1	1	0	0
West Virginia	59	2	45	0
Wyoming	267	46	139	31
Total U.S.	5,894	585	8,108	594

Quarter century record of U.S. well completions

Year	Total wells	Total footage	Total wildcats
1988*	34,579	162,449,000	5,678
1987	34,927	157,544,000	6,890
1986	38,870	176,463,000	7,192
1985	70,806	316,778,000	12,208
1984	84,983	368,796,000	15,138
1983	75,738	316,617,464	13,846
1982	83,889	375,382,919	15,882
1981	89,234	406,520,453	17,430
1980	69,486	311,444,837	12,870
1979	51,890	243,685,430	10,736
1978	50,061	238,386,248	11,030
1977	45,855	215,695,878	10,140
1976	40,940	187,289,586	9,317
1975	38,884	181,039,993	9,459
1974	33,037	153,776,399	8,969
1973	27,692	139,424,738	7,771
1972	27,934	138,796,562	7,551
1971	26,268	127,255,952	7,131
1970	28,173	138,559,527	7,436
1969	32,187	157,107,859	9,701
1968	30,559	144,970,447	8,879
1967	32,234	141,356,463	8,878
1966	36,384	162,445,209	10,313
1965	39,501	181,427,015	9,456
1964	42,963	189,921,870	10,747
1963	41,386	184,357,000	10,664

*Estimated.

U.S. fields with reserves exceeding 100 million bbl

State Field Disc. date	1988 prod.	Cum. prod. 1-1-89	Est. rem. reserves	Est. No. wells
	1,000 bbl			
ALABAMA				
Citronelle, 1955	1,827	147,861	7,000	435
ALASKA				
Endicott, 1978	36,098	43,098	324,902	37
Granite Point, 1965	2,787	109,535	16,213	29
Kuparuk River, 1969	112,055	503,397	994,945	328
Lisburne, 1967	14,600	35,600	175,689	49
McArthur River, 1965	7,040	529,040	34,960	76
Middle Ground Shoal, 1962	2,737	155,889	5,263	42
Prudhoe Bay, 1967	576,335*	6,053,018†	3,533,665	691
Swanson River, 1957	2,154	209,490	8,846	29
ARKANSAS				
Smackover, 1922	2,664	556,907	9,097	2,100
CALIFORNIA				
San Joaquin Valley				
Belridge South, 1911	60,583	677,083	435,286	6,000
Buena Vista, 1909	1,574	647,274	38,271	895
Coalinga, 1890	10,212	753,845	161,188	2,174
Coalinga Nose, 1938	1,285	498,685	17,370	78
Coles Levee North, 1938	442	160,432	2,748	85
Cuyama South, 1949	469	218,191	6,938	105
Cymric, 1909	8,479	199,308	40,000	1,013
Edison, 1928	1,470	134,391	26,670	674
Elk Hills, 1911	39,144	893,374	579,776	1,099
Fruitvale, 1928	577	115,553	13,709	274
Greeley, 1936	237	112,647	1,763	27
Kern Front, 1912	1,500	173,066	55,230	950
Kern River, 1899	46,899	1,204,479	743,000	6,709
Kettleman North Dome, 1928	172	456,648	1,298	44
Lost Hills, 1910	5,627	178,293	61,603	1,634
McKittrick, 1896	2,551	266,822	90,919	931
Midway-Sunset, 1894	57,497	1,879,347	373,863	9,180
Mount Poso, 1926	6,620	263,250	79,280	411
Rio Bravo, 1937	151	116,051	1,319	15
Yowlumne, 1974	6,570	81,368	27,015	65
Coastal Area				
Carpinteria, 1966	2,690	88,101	29,289	114
Cat Canyon E. & W., 1908	2,736	288,236	46,930	512
Dos Cuadras, 1969	4,371	212,804	54,140	140
Elwood, 1928	317	105,705	2,283	7
Hondo, 1969	9,952	89,621	112,223	20
Orcutt, 1901	906	165,874	10,238	136
Point Pedernales, 1982†	6,515	11,715	331,544	10
Rincon, 1927	1,118	148,759	14,832	240
San Ardo, 1947	4,641	408,351	122,903	600
Santa Maria Valley, 1934	1,751	198,131	40,408	172
South Mountain, 1916	727	145,984	12,035	352
Ventura, 1919	7,072	894,742	97,026	570
Los Angeles Basin				
Beta, 1976	6,013	40,423	173,825	60
Beverly Hills, 1900	2,034	122,616	42,356	116
Brea Olinda, 1880	2,143	383,894	54,787	720
Coyote East, 1909	584	108,663	13,212	103
Coyote West, 1909	808	249,969	7,481	113
Dominguez, 1923	607	269,266	7,448	113
Huntington Beach, 1920	5,816	1,066,368	72,044	990
Inglewood, 1924	2,790	345,453	54,149	366
Long Beach, 1921	2,466	909,757	17,216	410
Montebello, 1917	526	192,357	10,267	155
Richfield, 1919	1,494	189,165	27,412	203
Santa Fe Springs, 1919	987	613,077	9,036	151
Seal Beach, 1924	876	203,118	14,118	168
Torrance, 1922	1,693	212,083	35,847	366
Wilmington, 1932	29,921	2,292,229	495,633	2,050
COLORADO				
Rangely, 1933	12,492	739,418	35,000	488

State Field Disc. date	1988 prod.	Cum. prod. 1-1-89	Est. rem. reserves	Est. No. wells
	1,000 bbl			
FLORIDA				
Jay, 1970	4,676	360,612	55,944	121
ILLINOIS				
Clay City, 1938	2,448	393,860	6,000	2,600
Lawrence, 1906	2,919	394,521	5,500	2,700
Louden, 1938	1,345	388,237	3,555	1,340
Main, 1906	2,066	233,273	5,000	3,356
New Harmony, 1939	1,072	153,545	4,000	1,140
Salem, 1938	2,167	386,983	4,500	1,325
KANSAS				
Bemis-Shutts, 1928	1,169	244,247	4,405	973
Chase-Silica, 1930	1,018	301,003	4,499	1,103
El Dorado, 1915	839	296,734	2,616	822
Hall-Gurney, 1931	1,032	145,677	4,051	1,130
Trapp, 1929	1,200	225,888	4,643	1,000
LOUISIANA				
Offshore				
Bay Marchand Blk. 2, 1949	5,547	596,972	53,758	120
Eugene Island Blk. 330, 1930	7,859	269,080	55,920	169
Grande Isle Blk. 16, 1948	1,659	263,729	85,645	44
Grande Isle Blk. 43, 1956	4,312	272,256	85,688	126
Mississippi Canyon Blk. 194, 1980	4,929	116,868	76,311	44
Main Pass Blk. 41, 1957	2,985	237,854	23,384	112
Main Pass Blk. 306, 1969	1,776	201,869	78,335	94
South Pass Blk. 27, 1954	1,659	125,317	73,198	118
South Pass Blk. 61, 1968	8,140	152,151	45,000	156
South Pass Blk. 62, 1965	3,331	106,364	81,594	73
South Pass Blk. 65, 1969	4,032	100,875	89,252	61
Ship Shoal Blk. 204, 1968	1,591	66,070	38,930	40
Ship Shoal Blk. 207, 1967	1,023	87,818	38,000	25
Ship Shoal Blk. 208, 1962	4,117	160,169	65,274	67
South Timbalier Blk. 21, 1939	1,324	216,239	47,133	45
South Timbalier Blk. 135, 1956	1,390	139,337	25,663	37
West Delta Blk. 30, 1949	6,754	446,083	47,375	153
West Delta Blk. 73, 1962	4,469	188,700	86,291	73
Onshore South				
Bay de Chene, 1941	390	96,382	17,952	24
Bay St. Elaine, 1928	321	164,808	25,292	18
Bayou Sole, 1941	769	161,369	3,417	20
Black Bay West, 1953	1,971	144,799	10,432	94
Caillou Island, 1930	2,308	602,231	74,020	136
Cote Blanche Bay West, 1940	741	181,594	46,374	86
Delta Farms, 1944	293	115,351	7,019	13
Garden Island Bay, 1934	1,406	221,261	31,954	144
Golden Meadow, 1938	894	135,439	4,290	176
Grand Bay, 1938	454	170,514	3,760	41
Hackberry, East, 1927	777	109,087	7,603	60
Hackberry, West, 1928	1,771	141,895	6,492	107
Iowa, 1931	134	99,303	697	25
Jennings, 1901	315	116,409	700	181
Lafitte, 1935	1,665	255,304	9,550	111
Lake Barre, 1929	941	204,023	20,061	31
Lake Pelto, 1929	477	117,000	17,415	23
Lake Washington, 1931	2,353	242,390	16,376	93
Leeville, 1931	447	141,646	7,221	37
Paradis, 1939	725	126,650	8,600	31

*Includes about 30.66 million bbl of condensate. †Includes about 138.66 million bbl of condensate.

State Field Disc. date	1988 prod.	Cum. prod. 1-1-89	Est. rem. reserves	Est. No. wells
		1,000 bbl		
Quarantine Bay, 1937	761	172,672	1,654	71
Timbalier Bay, 1938				
Venice, 1937	858	181,878	7,590	59
Vinton, 1910	287	161,001	800	96
Weeks Island, 1945	816	225,939	21,356	33
West Bay, 1940	1,349	228,246	16,355	79
North				
Caddo-Pine Island 1905	3,310	360,899	12,888	10,688
Delhi, 1944	673	211,707	34,651	58
Haynesville, 1921	761	168,237	2,373	166
Homer, 1919	434	98,375	1,908	198
Rodessa, 1935	331	106,027	1,506	67
MISSISSIPPI				
Baxterville, 1944	2,609	239,164	10,391	316
Heidelberg, 1944	2,829	174,809	12,171	316
Tinsley, 1939	834	29,677	3,197	173
MONTANA				
Bell Creek, 1967	958	128,836	22,984	91
Cut Bank, 1926	994	162,459	37,169	575
Pine, 1951	1,302	105,145	5,687	96
NEW MEXICO				
Denton, 1949	652	138,693	3,000	179
Empire-Abo, 1957	1,424	219,983	50,017	405
Eunice-Monument, 1929	2,500	125,414	10,894	879
Hobbs, 1928	8,480	297,482	20,000	613
Maljamar, 1926	1,869	144,961	5,070	851
Vacuum, 1929	12,359	432,242	40,000	1,556
NORTH DAKOTA				
Beaver Lodge, 1951	1,704	111,574	16,684	132
Billings Nose, 1978	2,560	61,669	51,744	153
Little Knife, 1977	3,392	51,437	57,924	131
Mondak, 1976	439	13,165	82,887	96
OKLAHOMA				
Burbank, 1920	1,135	536,746	8,377	1,105
Eola-Robberson,				
1920	746	133,124	8,210	603
Fitts, 1934	2,963	199,894	12,000	589
Glenn Pool, 1905	1,170	327,865	5,000	714
Golden Trend, 1945	4,333	474,100	28,000	1,396
Healdton, 1913	1,938	334,645	9,563	1,000
Hewitt, 1919	3,152	268,371	13,615	923
Oklahoma City, 1928	802	816,170	5,966	174
Postle, 1958	1,216	106,393	14,921	226
Sho-Vel-Tum, 1905	18,398	1,167,379	60,000	7,616
Sooner Trend, 1945	4,147	295,544	20,000	4,746
TEXAS				
District 2				
Greta, 1933	748	147,570	12,530	100
Lake Pasture, 1953	2,184	87,784	12,644	143
Tom O'Connor, 1934	10,380	747,848	55,000	646
West Ranch, 1938	2,640	380,034	8,504	307
District 3				
Anahuac, 1935	1,068	284,888	15,112	106
Conroe, 1931	3,864	727,215	33,728	278
Giddings, 1971	8,868	278,570	148,032	2,281
Hastings, 1934	3,084	697,237	72,764	206
Magnet Withers, 1936	1,884	110,960	5,000	150
Oyster Bayou, 1941	864	160,204	18,096	39
Thompson, 1931	3,972	472,540	27,360	262
Tomball, 1933	400	121,056	9,868	86
Webster, 1937	5,304	573,192	20,000	243
District 4				
Agua Dulce-Stratton,				
1928	360	146,623	24,751	94
Borregos, 1945	192	114,021	20,186	40
Kelsey, 1938	200	114,859	36,247	60
Plymouth, 1925	400	122,823	3,300	60
Seeligson, 1925	156	271,483	55,544	42
TCB, 1944	456	112,700	52,358	30
White Point E, 1938	60	104,034	6,340	21
District 5				
Alabama Ferry, 1983	3,600	14,600	86,400	253
Van, 1928	3,096	521,960	15,000	366
District 6				
East Texas, 1930	40,597	5,008,747	988,758	9,363
Fairway, 1960	2,424	192,691	17,777	100
Hawkins, 1940	8,244	821,644	42,372	442
Neches, 1953	1,416	103,980	6,036	163
Quitman, 1948	1,680	121,346	8,440	208
District 8				
Andector, 1946	1,500	181,888	6,500	28
Block 31, 1945	3,556	220,068	12,000	325
Cowden, N., 1930	13,596	488,092	40,000	1,210
Cowden, S. Foster,				
Johnson, 1932	9,696	500,796	40,000	1,593
Dollarhide, 1945	2,568	193,780	11,448	202
Dune, 1938	2,928	183,000	18,704	771
Fullerton, 1942	7,452	348,200	22,000	870
Goldsmith, 1934	7,248	755,516	33,752	2,036
Howard Glasscock, 1925	5,844	404,508	26,000	2,208
Iatan, E., 1926	3,372	142,956	12,000	1,304
Jordan, 1937	480	128,976	2,520	138
Keystone, 1930	1,872	313,080	9,374	812
McElroy, 1926	7,884	465,549	56,800	1,600
Means, 1934	7,020	228,598	20,000	713
Midland Farms, 1944	4,608	241,980	18,616	415
Sand Hills, 1931	2,760	248,207	21,600	1,312
TXL, 1944	2,004	263,516	6,500	600
Waddell, 1927	708	100,712	3,792	188
Ward Estes, N., 1929	3,408	364,177	76,436	1,562
Westbrook, 1923	2,000	88,000	16,000	718
Yates, 1926	33,540	1,171,820	782,685	1,146
District 8-A				
Anton-Irish, 1944	3,564	175,910	24,190	239
Cogdell Area, 1949	1,656	292,218	41,204	103
Diamond M., 1948	1,908	239,418	16,063	474
Kelly-Snyder, 1948	11,592	1,234,962	115,038	806
Levelland, 1938	17,328	484,144	50,000	3,012
Prentice, 1951	6,216	161,036	20,000	437
Salt Creek, 1950	10,404	247,340	12,552	173
Seminole, 1936	17,004	524,768	36,000	624
Slaughter, 1936	20,364	1,029,800	50,000	3,001
Spraberry Trend, 1951	22,212	653,388	50,000	7,321
Wasson, 1936	28,656	1,711,898	60,000	2,152
Welch, 1942	3,324	144,228	14,000	651
District 10				
Panhandle, 1921	7,812	1,423,286	41,240	11,643
UTAH				
Altamont, 1955	3,047	89,493	231,216	227
Aneth, 1956	5,340	354,004	30,000	461
East Anschutz Ranch,				
1979	12,756	80,365	727,799	28
Red Wash, 1951	1,075	77,511	13,377	146
WYOMING				
Brady, 1960	2,438	54,637	49,251	22
Byron, 1918	1,119	120,688	7,656	67
Elk Basin, 1915	2,968	446,698	25,750	170
Frannie, 1928	1,122	116,020	5,000	63
Garland, 1906	2,625	154,885	6,000	225
Grass Creek, 1914	2,414	185,120	9,000	288
Hamilton Dome, 1918	2,853	268,109	6,000	239
Hartzog Draw, 1976	6,647	66,722	283,739	157
Hilite, 1969	541	75,416	55,885	93
Lance Creek, 1918	163	107,805	400	24
Little Buffalo Basin,				
1914	2,666	118,653	9,389	154
Lost Soldier, 1916	2,308	192,073	6,000	71
Oregon Basin, 1912	8,669	388,180	30,000	500
Painter Reservoir, 1979	1,739	31,674	80,674	31
Salt Creek, 1906	5,210	629,689	25,000	1,217
Wertz, 1920	3,500	99,695	15,000	65
Whitney Canyon, 1980	1,652	10,379	105,485	29

Drilling Technology

Worldwide horizontal drilling surges

About this report

Journal drilling editor Guntis Moritis has, with the assistance of the international oil industry, compiled extensive data on practically every major horizontal drilling project to date for this report. This compilation can serve as both a comparison of current practices and a guide for future projects. Along with this is an overview of a project and the drilling unit needed to drill and core what may be the world's deepest hole.

Guntis Moritis
Drilling Editor

The Journal's compilation of worldwide horizontal drilling projects in the following pages of this report reveals the numerous reasons this hot technology is being employed. They include:

Staying away from oil and gas contacts, increasing productivity, producing thin hydrocarbon reservoirs, controlling sand production, injecting steam, connecting vertical fractures, and producing low-permeability reservoirs. Also, increasing injectivity, producing gas from coal seams, circumventing topological restrictions, and providing better sweep efficiency.

Because these are such widely diverse reasons, no one well or development will determine the success or failure of horizontal drilling and completion technology. To look how this technology is being implemented, OGJ surveyed a large number of companies. They were asked to limit their response to wells with horizontal drain holes in the reservoir of 1,000 ft or more. This limitation primarily eliminated wells drilled with short-radius techniques.

The 133 medium-radius and long-radius wells, listed in Table 3, are examples of technology that may portend the way reservoirs will be drilled and completed in the future.

The drilling of short-radius wells is also increasing.

This technology currently is limited to about

500-ft laterals, but design improvements in tools may soon allow extending the drain holes to at least 1,000 ft. Table 3 does include some wells with horizontal lengths in the reservoir less than 1,000 ft. These are shown because they were part of a larger development program or because the data were made available.

Surge in activity. The survey illustrates that horizontal drilling, although some of the technology dates back to the 1920s, has gained widespread accceptance only in the last 3 years. From 1978 through 1984, only 1 well/year is listed. In 1985, drilling increased to 4 wells.

Then in 1986 and 1987 a sharp increase to 28 and 29 wells/year occurred. This was followed by wells per year more than doubling to 63 wells in 1988. For 1989, Table 1 shows that 19 companies plan to drill between 87 and 96 horizontal wells that will have more than 1,000 ft of penetration into the reservoir.

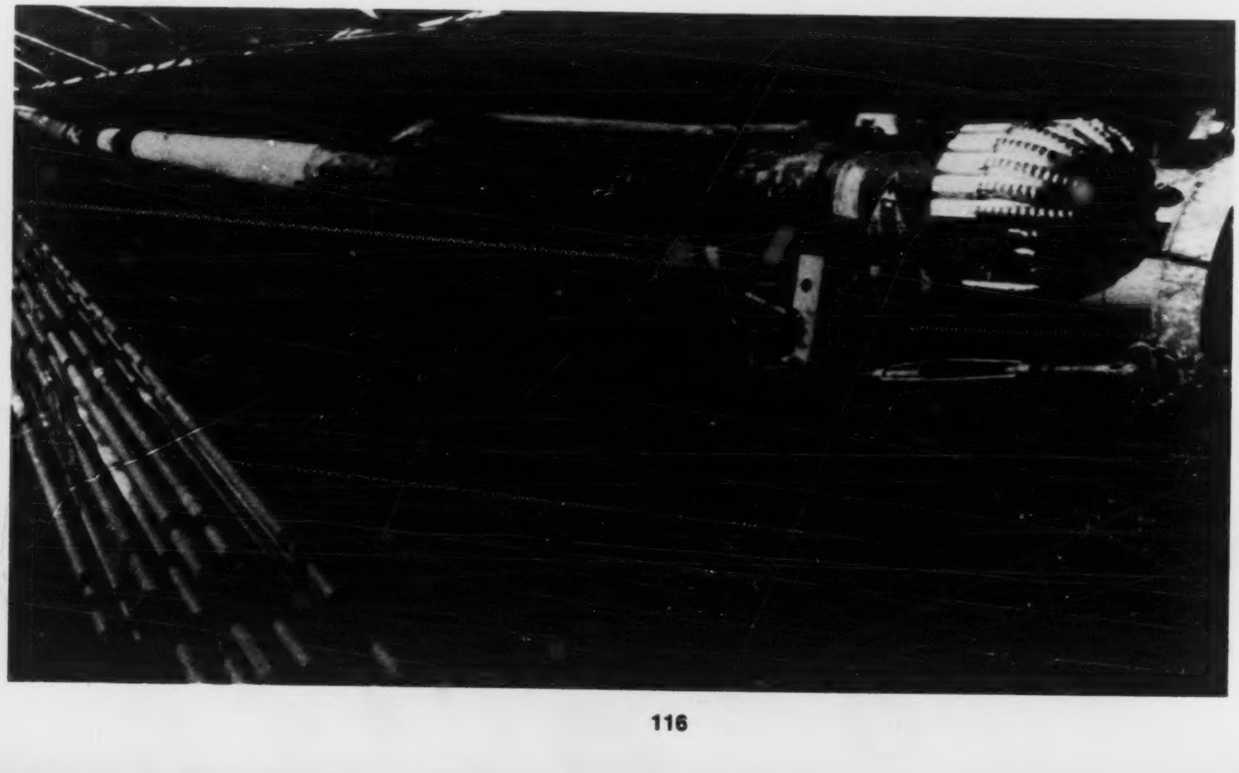
Although this number still represents a very small portion of all the wells drilled, some are predicting that eventually as many as 30% of all holes will be drilled horizontally. Other predictions go as high as 70%.

One survey by Eastman Christensen, including wells with less than 1,000-ft drains, indicates that about 200 horizontal wells were drilled in 1988, and this number should double to about 400 in 1989. Historically,

Table 1

Horizontal wells planned for 1989 (wells drilled with over a 1,000-ft horizontal lateral in the reservoir)

Company	No. of wells	Location
AGIP	1	Adriatic Sea
Alcorn International	1	Galoc field, offshore Phillipines
Amoco Production	1-2	Netherlands, and the Austin Chalk in Texas
Arco Alaska	6	Prudhoe Bay and Lisburne fields, Alaska
Atlantic Richfield Indonesia	6	Bima field, Java Sea
BP Exploration	1	Cyrus field, UKCS Block 16/28
Chevron	2 1	Cabinda, Angola Bakersfield, Calif
CS Resources	5-10	Canada
Elf Aquitaine	5	Rospo Mare fields
Hungarian National Petroleum and Gas Trust	1	Kiskundorozsma field, Hungary
Husky Oil	1	Rainbow Lake in NW Alta., Canada
Maersk Olie Og Gas	3-6	Dan, Tyra, and Valdemar fields offshore Denmark
Meridian Oil	± 30	Mostly in the Williston basin and some in the San Juan basin
Mobil	3	Canada, Texas, and the North Sea
Norsk Hydro	1	Troll field, North Sea
Stewart Petroleum	1	Alkali Lake field
Shell International Petroleum Maatschappij	± 10	Denmark, Malaysia, Gabon, Netherlands, Canada
Union Pacific Resources	6	Burleson Co., Tex.
Unocal Netherlands	2	Offshore Netherlands
Total wells	87-96	



Suspended in the derrick is a bottom-hole assembly for drilling a horizontal well with a medium-radius buildup (Fig. 1).

through mid-1988, Eastman Christensen estimates that about 470 short-radius, 75 medium-radius, and 68 long-radius wells have been drilled. Over 150 of the short-radius wells were drilled by Texas Eastern Drilling Systems Inc. (Tedsi), now assimilated by Eastman Christensen, in the early 1980s (OGJ, Oct. 1, 1984, p. 118).

Marathon Oil has drilled seven short radius wells in the Yates field in Texas and seven in the Albion-Scipio field in Michigan. The average horizontal lateral was 200 ft.

Alberta Oil Sands Technology and Research Authority (Aostra) has been active in a number of pilot projects in Canada that used horizontal holes. These wells also had less than 1,000-ft horizontal laterals. Ensearch Exploration is another company that has drilled a short-radius well in 1988.

Well data. Table 3 clearly illustrates the worldwide scope of interest in horizontal wells.

The U.S. has the most wells listed, a total of 54. This is followed by 30 in the North Sea and Europe, 26 in Asia, 19 in Canada, 3 in Australia, and 1 in South America.

The shallowest well, with a true vertical depth of 1,253 ft, is the Petrobras well 9-FZB-446D-CE in Ceara, Brazil. The deepest, at 10,796 ft, is Meridian Oil's 33-35H in the Bicentennial field of North Dakota. The furtherest horizontal displacement of 9,586 ft was drilled by Standard Oil in the Endicott L-28 well located on an island off Alaska.

Esso Resources Canada Ltd. drilled the longest length in the reservoir, 4,013 ft, in the Norman Wells K-50X well, located in N.W.T. Canada.

Ten of the wells listed had cores cut in the horizontal section. The most cores, a total of eight, were obtained in Elf's Rospo Mare No. 6. Amoco, Maersk, Petrobras, and Standard were other companies that successfully were able to recover cores. In completing, two of Elf's wells used inflatable packers, and six of the Standard wells were perforated selectively.

All of the wells were completed with single strings of tubing except for dual completions in four of Elf's and one of CS Resources's wells. Twelve of the wells had production logs run. These logs included spinner, temperature, density, and gamma ray tools.

Tools. Development of new tools and procedures has allowed drilling of horizontal wells to be much more practical. Fig. 1 shows, hanging in the derrick, one type of assembly for drilling medium-radius wells. The bend angle in the assembly is clearly visible. By adding bent subs to steerable motors and using computerized programs to calculate the assembly's configuration, build rates and directional drilling control has vastly improved. In the wells drilled over 1,000 ft, maximum build angles in Table 3 range from 2.1° to 17.2°/100 ft. In the shorter-length wells, such as Amoco's Austin Chalk wells, the maximum build angle was 27°/100 ft.

One recent development is the remote-controlled bent sub. This tool allows changing the bend angle from the surface by increasing mud flow beyond a previously determined threshold value (see OGJ, Jan. 30, 1989). Measurement-while-drilling (MWD) technology has also added control and enabled the retrieving of data from horizontal holes. Logging these lateral holes is made possible by running the tools on drill pipe, coiled tubing, and pumpdown stingers.

Offshore, top drive is commonly used when drilling horizontal wells. Semisubmersible rigs have now been

Table 2

Helder field—production increase

	Production in original well		Production in horizontal sidetrack	
Well No.	bo/d	water cut, %	bo/d	water cut, %
A-2	422	96.7	586	70.5
A-3	441	95.7	1,260	18.0
A-4	—	—	2,090	1.4
A-5	585	94.2	2,036	1.0
A-7	546	95.0	1,343	5.3
A-8	363	95.8	1,837	47.4
A-10	695	93.8	1,887	2.9
A-11	816	91.3	1,768	9.8
A-12	551	96.1	2,556	10.7
B-1	571	84.0	1,279	14.0
P/9-6	340*	—	4,400	—

* Production in exploration well

Nomenclature for survey abbreviations

Mud type:

BM	Bentonite mud
FW	Fresh water
Gel	Bentonite mud
IBM	Improved bentonite mud
KCl	Potassium chloride mud
LG	Lignosulfonate
LS ND	Low solids nondispersed
LTox	Low Tox
Nat	Native
OBM	Oil-base mud
PM	Polymer
SW	Salt water

Completion type:

CL	Cemented liner
IT	Insulated tubing (Baker heatsaver)
OH	Open hole
Perf	Perforations
PGPL	Prepacked gravel-packed liner
Pkr	Packer
PL	Perforated liner
SL	Slotted liner

Artifical lift:

ESP	Electric submersible pump
GL	Gas lift
GLA	Gas lift available
LSRP	Long stroke rod pumps
MP	Moineau-type pump
Rec	Reciprocal pump
RP	Rod pump

Present status of well:

F	Flowing
P	Producing
S	Suspended
SI	Shut-in
C	Completing
GP	Gas producer
TH	Tight hole
PL	Plugged
PL/A	Plugged and abandoned
GI	Gas injector
E	Evaluating
D	Drilling
PMP	Pumping
T	Testing

Reservoir rock:

C	Carbonate
Ca	Calcite
Cal K	Calcareous karst
Ch	Chalk
KL	Karstified limestone
FS	Fractured sandstone
LS	Limestone
S	Sand
Si	Siltstone
Sh	Shale
SS	Sandstone
US	Unconsolidated sand

Main reservoir heterogenity:

Disc Sh	Discontinous shale
DP	Dual porosity
DS	Dolomite stringers
F	Fractures
Hom	Homogeneous
TL	Tight layers
TM	Tight matrix
TS	Tight streaks

Reason for horizontal drilling:

CRG	Increase critical rate to gas
CRW	Increase critical rate to water
IFS	Intersect fracture system
IR	Improve recovery
GC	Gas coning
PI	Productivity increase
TOC	Thin oil column
Topo	Topological
WC	Water coning

Horizontal well survey

Company	Field, location	Well number	Present status of the well*	Completion date	Total days, drill and complete	True vertical depth, ft	Horizontal displacement, ft	Maximum inclination, degrees	Length drilled horizontally in reservoir, ft	Length of pay, ft	Top drive	Maximum buildup rate, degrees	Mud type
Alberta En.	Suffield, Alta.	51	P	11/87	36	3,074	1,326	95.10	942	820	Yes	28/30m	IBM
Alberta En.	Suffield, Alta	11M	C	2/89	13	3,051	3,408	90.60	2,149	2,149	No	8.6/30m	PM
Amoco Prod.	Liuhua 11-1, S. China Sea	6	T	1/89	43	3,988	3,779	92.30	2,124	2,010	Yes	9/100 ft	LTox, OBM
Amoco Prod.	Giddings, Tex.	10 wells	P	85-88	n/a	7,500- 9,000	475 2,400	90.0- 135.0	475- 2,655	475- 2,220	Yes No	28/30 m 27/100 ft	IBM n/a
ARCO Indonesia	Arjuna, Java Sea	ZUC-9	P	4/86	11	2,649	2,989	89.20	1,755	1,755	No	6.53/100 ft	SW, GEL
ARCO Indonesia	Arjuna, Java Sea	ZUC-6	F	6/86	22	2,656	1,790	90.10	1,067	354	No	9/100 ft	SW, GEL, PM
ARCO Indonesia	Arjuna, Java Sea	ZUF-7	SI	7/86	21	2,669	2,208	85.20	1,010	492	No	7.3/100 ft	SW, BRINE
ARCO Indonesia	Arjuna, Java Sea	PE-7	P	8/87	24	3,021	2,772	88.00	1,701	1,621	No	17.2/100 ft	SW, GEL
ARCO Indonesia	Arjuna, Java Sea	PB-7	P	9/87	19	2,987	2,091	91.60	1,176	1,114	No	9.41/100 ft	SW, LG
ARCO Indonesia	Arjuna, Java Sea	PF-6	P	9/87	14	3,029	1,170	88.00	300	284	No	9.62/100 ft	SW, PRE, GEL
ARCO Indonesia	Arjuna, Java Sea	ZUB-9	P	3/88	17	2,680	2,291	91.40	427	427	No	6.82/100 ft	SW, GEL
ARCO Indonesia	Arjuna, Java Sea	ZUC-2	P	7/88	16	2,656	3,165	91.10	1,663	1,663	No	6.39/100 ft	SW, GEL
ARCO Indonesia	Bima, Java Sea	ZUC-4	F	5/86	27	3,113	857	86.20	801	492	No	9.6/100 ft	SW, GEL, PM
ARCO Indonesia	Bima, Java Sea	ZUE-6ST	SI	6/86	32	2,678	3,535	92.90	1,805	862	No	4.27/100 ft	SW, BRINE
ARCO Indonesia	Bima, Java Sea	ZUG-8	P	7/86	18	2,673	1,463	81.40	182	164	No	9/100 ft	SW, PM
ARCO Indonesia	Bima, Java Sea	ZUE-9	P	7/86	20	2,650	2,956	91.60	1,789	1,789	No	6.93/100 ft	SW, NAT, LG
ARCO Indonesia	Bima, Java Sea	ZUE-4	P	7/86	19	2,676	2,179	86.50	872	382	No	6.34/100 ft	SW, LG
ARCO Indonesia	Bima, Java Sea	ZUG-2	SI	7/86	22	2,671	2,866	99.20	1,520	1,263	No	8.1/100 ft	SW, GEL, PM
ARCO Indonesia	Bima, Java Sea	ZUD-4	P	7/86	23	2,668	2,966	92.60	966	770	No	7.4/100 ft	SW, GEL
ARCO Indonesia	Bima, Java Sea	ZUD-3	SI	8/86	32	2,670	2,164	85.75	568	568	No	7.36/100 ft	SW, PM
ARCO Indonesia	Bima, Java Sea	ZUG-1	P	9/86	35	2,660	3,401	95.70	1,768	1,202	No	5.47/100 ft	SW, GEL, PM
ARCO Indonesia	Bima, Java Sea	ZUA-9	P	9/86	26	2,677	3,702	89.50	1,845	1,845	No	5.55/100 ft	SW, GEL, LG
ARCO Indonesia	Bima, Java Sea	ZUA-4	P	10/86	16	2,668	3,318	94.10	1,222	1,222	No	4.8/100 ft	SW,CLAY, LG
ARCO Indonesia	Bima, Java Sea	ZUA-8ST	P	12/86	18	2,691	2,283	92.60	1,006	1,006	No	9.26/100 ft	SW, LG
ARCO Indonesia	Bima, Java Sea	ZUB-4	P	1/87	15	2,655	3,000	91.80	1,845	1,845	No	7.5/100 ft	SW, GEL
ARCO Indonesia	Bima, Java Sea	ZUA-7	P	10/88	16	2,654	3,720	91.10	2,531	2,531	No	6.6/100 ft	SW, LG
ARCO Indonesia	Bima, Java Sea	ZUG-3	P	12/88	11	2,679	2,712	91.10	1,747	1,747	No	7.02/100 ft	SW, LG
ARCO Indonesia	Bima, Java Sea	ZUG-7	P	12/88	10	2,673	2,349	91.80	1,231	1,231	No	8.46/100 ft	SW, NAT
Arco Alaska	Prudhoe Bay, DS 18	18	P	12/88	41	8,709	1,119	90.80	2,575	1,208	No	2.5/100 ft	OBM
BP Expl.	Cyrus, UKCS	11	S	4/89	46	8,419	6,542	91.60	2,526	2,526	Yes	3/30 m	LTox OBM
CS Res.	Pelican, Alta.	14-10A	P	2/88	12	1,345	2,389	93.00	1,470	n/a	n/a	3/10 m	PM
CS Res.	Pelican, Alta.	14-10B	P	3/88	10	1,345	2,648	92.70	1,703	n/a	n/a	3/10 m	PM
CS. Res.	Pelican, Alta.	14-10C	P	3/88	9	1,345	2,576	93.20	1,644	n/a	n/a	3/10 m	PM
CS Res.	Pelican, Alta.	14-10D	P	3/88	9	1,345	2,763	92.00	1,641	n/a	n/a	3/10 m	PM
CS Res.	Pelican, Alta.	11-15A	P	7/88	8	1,345	2,713	92.40	1,641	n/a	n/a	3/10 m	PM
CS Res.	Pelican, Alta.	11-15B	P	7/88	7	1,345	2,717	91.70	1,641	n/a	n/a	3/10 m	PM
CS Res.	Pelican, Alta.	11-15C	P	8/88	9	1,345	2,799	96.50	1,641	n/a	n/a	3/10 m	PM
CS Res.	Pelican, Alta.	11-15D	P	8/88	10	1,345	2,592	91.50	1,654	n/a	n/a	3/10 m	PM
CS Res.	Winter, Sask.	B1A6	P	10/88	19	2,133	3,196	92.60	1,864	n/a	n/a	3/10 m	PM
CS Res.	Winter, Sask.	A9-29B14	P	10/88	9	2,133	2,690	94.20	1,762	n/a	n/a	3/10m	PM
Conoco	Elkhorn Ranch, N.D.	Federal 12-1	P	5/88	125	10,520	2,079	93.00	1,200	300	No	13.6/100 ft	OBM
Conoco	North Sunshine, Wyo.	May No. 4	P	11/87	33	3,611	1,330	87.50	1,100	850	No	20/100 ft	Air-Mist
Elf	Caster Lou, France	110	P	10/83	139	9,489	4,160	90.50	1,112	984	No	1.9/10 m	IBM
Elf	Chateurenard, France	136	P	3/86	53	1,903	2,759	91.20	1,106	1,106	Yes	2.3/10 m	PM, Suph
Elf	Lacq, France	90	P	6/80	48	2,198	2,195	92.00	902	837	No	2.2/10 m	BM
Elf	Lacq, France	91	SI	4/81	68	2,205	2,720	93.00	1,549	1,549	No	3.3/10 m	PM
Elf	Lacq Superieur, France	LA 414	C	10/88	47	2,165	1,171	94.70	1,837	1,171	No	2.9/10 m	Water, HEC
Elf	Rospo Mare, Off. Italy	6	P	5/82	87	4,524	4,278	96.50	1,978	1,355	No	3/10 m	SW
Elf	Rospo Mare, Off. Italy	211	P	9/86	59	4,472	3,301	98.20	1,811	1,683	Yes	2.3/10 m	SW
Elf	Rospo Mare, Off. Italy	212	P	11/86	45	4,462	3,370	96.00	1,604	1,385	Yes	1.9/10 m	SW
Elf	Rospo Mare, Off. Italy	214	P	1/87	44	4,515	3,311	91.60	1,837	1,631	Yes	2.3/10 m	SW
Elf	Rospo Mare, Off. Italy	213	P	2/87	42	4,485	3,370	91.00	2,165	2,165	Yes	2.7/10 m	SW
Elf	Rospo Mare, Off. Italy	215	P	4/87	38	4,475	3,734	89.90	1,939	1,939	Yes	2.2/10 m	SW
Elf	Rospo Mare, Off. Italy	105 Z	C	12/88	52	4,167	4,249	90.40	1,618	1,181	Yes	2.3/10 m	SW
Elf	Zuidwal, Off. Nether.	ZDW A6	GP	4/88	66	6,329	4,981	91.00	2,136	1,493	Yes	2.1/10 m	KCL
Elf	Zuidwal, Off. Nether.	ZDW A9	GP	10/88	61	6,349	3,353	93.70	1,759	1,178	Yes	3/10 m	KCL
Elf	Zuidwal, Off. Nether.	ZDW A8	GP	11/88	66	6,339	2,346	96.00	2,001	1,509	Yes	2.4/10 m	KCL
Esso Res.	Cold Lakes, Alta.	Pilot 1	P	78	42	1,558	2,045	90.20	1,059	n/a	No	4.3/100 ft	OMB
Esso Res.	Cold Lakes, Alta.	Pilot 2	P	84	38	1,558	4,721	93.00	3,416	n/a	No	4.5/30 m	FW, GEL
Esso Res.	Norman Wells, N.W.T.	J-29X	PL/A	79	48	1,542	4,921	91.00	3,333	n/a	No	6.0/30 m	OMB
Esso Res.	Norman Wells, N.W.T.	I-50X	WI	85	24	1,782	5,000	90.00	1,017	n/a	No	6.0/30 m	FW, GEL
Esso Res.	Norman Wells, N.W.T.	K-50X	P	12/86	38	1,896	5,010	93.00	4,013	n/a	No	5.9/100 ft	FW, GEL, PM
Esso Res.	Norman Wells, N.W.T.	F-50X	P	5/87	39	1,795	5,013	87.00	3,409	n/a	No	6.3/100 ft	FW, GEL, PM
Maersk	Dan, Off. Denmark	MFB-14B	P	6/87	109	6,364	5,663	88.10	1,754	1,279	Yes	4.84/100 ft	FW, GEL, PM
Maersk	Dan, Off. Denmark	MFB-13	P	5/88	69	6,180	4,949	91.60	3,546	3,155	Yes	6.54/100 ft	FW, GEL, PM

Table 3

Reason for horizontal drilling	Completion	Artificial lift	Spacing, acre	Pay thickness, ft	Permability, md	Viscosity, cp	Temperature, °F.	Reservoir rock	Main reservoir heterogeneity	Oil production, b/d	Water production, bw/d	Gas production, Mcfd
WC	CL	RP	3	49	1,000.0	100	90	SS	None	126	0	n/a
WC	UL	RP	3	49	1,000.0	100	90	SS	None	126	0	n/a
WC	UL	ESP	n/a	220 2,000	1,000-	60	126	LS	TS	n/a	n/a	n/a
WC	CL	RP	3	41	1,000.0	100	90	SS	None	126	0	n/a
IF	n/a	RP	80	n/a	<0.1	n/a	n/a	LS,Ch	F	n/a	n/a	n/a
GC/WC	SL	ESP	60	118	4,000.0	32	155	C	Vugs	494	212	185
GC/WC	SL	ESP	60	110	>4,000.0	32	155	C	Vugs	314	104	1,856
GC/WC	CL	ESP	60	142	>4,000.0	32	155	C	Vugs	71	12	1,193
GC/WC	SL	ESP	20	81	>1,500.0	5	178	C	Vugs	35	1,226	21
GC/WC	SL	ESP	20	120	>1,500.0	5	178	C	Vugs	229	1,493	61
GC/WC	SL	ESP	50	52	>1,500.0	5	178	C	Vugs	152	1,452	66
GC/WC	SL	ESP	60	56	>4,000.0	32	155	C	Vugs	350	136	40
GC/WC	SL	ESP	60	105	>4,000.0	32	155	C	Vugs	461	115	172
GC/WC	SL	ESP	60	120	>4,000.0	32	155	C	Vugs	363	156	1,095
GC/WC	CL	ESP	60	146	>4,000.0	32	155	C	Vugs	57	25	3,878
GC/WC	SL	ESP	60	94	>4,000.0	32	155	C	Vugs	567	378	121
GC/WC	SL	ESP	60	142	>4,000.0	32	155	C	Vugs	229	56	111
GC/WC	SL	ESP	60	103	>4,000.0	32	155	C	Vugs	116	26	92
GC/WC	SL	ESP	60	97	>4,000.0	32	155	C	Vugs	162	36	1,097
GC/WC	SL	ESP	60	82	>4,000.0	32	155	C	Vugs	433	469	109
GC/WC	SL	ESP	60	100	>4,000.0	32	155	C	Vugs	287	1,146	116
GC/WC	SL	ESP	60	64	>4,000.0	32	155	C	Vugs	339	626	90
GC/WC	SL	ESP	60	65	>4,000.0	32	155	C	Vugs	673	791	49
GC/WC	SL	ESP	60	62	>4,000.0	32	155	C	Vugs	393	168	44
GC/WC	SL	ESP	60	60	>4,000.0	32	155	C	Vugs	360	127	34
GC/WC	SL	ESP	60	63	>4,000.0	32	155	C	Vugs	414	138	56
GC/WC	SL	ESP	60	84	>4,000.0	32	155	C	Vugs	747	132	48
GC/WC	SL	ESP	60	97	>4,000.0	32	155	C	Vugs	831	235	187
GC/WC	SL	ESP	60	77	>4,000.0	32	155	C	Vugs	567	378	123
PI, TOC	SL	None	160	30	n/a	n/a	190	SS	SS	1,000	0	750
TOC	SL	n/a	250	105	200.0	1	234	US	n/a	6,200	n/a	n/a
Econ.	SL	MP	20	16	n/a	n/a	n/a	S	No	n/a	n/a	n/a
Econ.	SL	MP	20	16	n/a	n/a	n/a	S	No	n/a	n/a	n/a
Econ.	SL	MP	20	16	n/a	n/a	n/a	S	No	n/a	n/a	n/a
Econ.	SL	MP	20	16	n/a	n/a	n/a	S	No	n/a	n/a	n/a
Econ.	SL	MP	20	16	n/a	n/a	n/a	S	No	n/a	n/a	n/a
Econ.	SL	MP	20	16	n/a	n/a	n/a	S	No	n/a	n/a	n/a
Econ.	SL	MP	20	16	n/a	n/a	n/a	S	No	n/a	n/a	n/a
Econ.	SL	MP	20	16	n/a	n/a	n/a	S	No	n/a	n/a	n/a
n/a	SL	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
PI	SL	Rec	n/a	39	n/a	n/a	n/a	S	n/a	n/a	n/a	n/a
PI	SL	None	160	8	n/a	n/a	n/a	Sh	F	35	0	18
IR	SL	RP	10-20	155	77.0	420	110	SS	DS	60	20	None
PI, SC	SL	RP	15	656	0.5	2	n/a	Cal	F	250	n/a	n/a
SC	SL	LSRP	40	23	1,000.0	40	n/a	US	Sh	300	n/a	n/a
PI	SL	ESP	7	279	1.0	17	n/a	C	F	20	2,000	n/a
PI	SL, CL	n/a	7	312	1.0	17	n/a	C	F	20	2,000	n/a
St. inj.	IT	n/a	± 22	295	1.0	17	129	LS	n/a	n/a	n/a	n/a
CRW	SL	LSRP	n/a	558	0.0	250	n/a	Cal K	F	1,300	n/a	n/a
CRW	SL	LSRP	n/a	394	0.0	250	n/a	Cal K	F	2,400	n/a	n/a
CRW	OH	LSRP	n/a	394	0.0	250	n/a	Cal K	F	3,500	n/a	n/a
CRW	OH	LSRP	n/a	394	0.0	250	n/a	Cal K	F	8,000	n/a	n/a
CRW	OH	n/a	n/a	394	0.0	250	n/a	Cal K	F	2,900	n/a	n/a
CRW	OH	n/a	n/a	394	0.0	250	n/a	Cal K	F	7,100	n/a	n/a
PI	OH	n/a	±120	492	1,000-10,000	250	149	KL	TM, LF	3,650	n/a	n/a
PI	SL	None	62	131	15.0	n/a	n/a	SS	None	n/a	n/a	84,700
PI	SL	None	62	131	15.0	n/a	n/a	SS	None	n/a	n/a	49,400
PI	SL	None	62	131	15.0	n/a	n/a	SS	None	n/a	n/a	56,400
PI	SL	RD	n/a	157	n/a	n/a	n/a	SS	None	n/a	n/a	n/a
PI	SL	GL	n/a	157	n/a	n/a	n/a	SS	None	n/a	n/a	n/a
Topo	SL	GL	n/a	300	n/a	n/a	n/a	LS	F	n/a	n/a	n/a
Topo	CL	INJ	n/a	300	n/a	n/a	n/a	LS	F	n/a	n/a	n/a
Topo	CL	GL	n/a	300	n/a	n/a	n/a	LS	F	n/a	n/a	n/a
Topo	CL	GL	n/a	300	n/a	n/a	n/a	LS	F	n/a	n/a	n/a
PI	CL	GL	40	250-300	0.5-1	1	167	Ch	TL	627	35	359
PI	CL	n/a	40	300-400	0.5-1	1	167	Ch	TL	3,031	9	8,440

Horizontal well survey (continued)

Company	Field, location	Well number	Present status of the well*	Completion date	Total days, drill and complete	True vertical depth, ft	Horizontal displacement, ft	Maximum inclination, degrees	Length drilled horizontally in reservoir, ft	Length of pay, ft	Top drive	Maximum buildup rate, degrees	Mud type
Maersk	Dan, Off. Denmark	MFB-15	P	4/88	90	6,270	8,714	91.90	3,742	3,558	Yes	5.18/100 ft	FW, GEL, PM
McCormick	Athens, Pa.	Vanderhoff 1	TH	88	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Mccormick	Mondak, N.D.	Federal 14-14	TH	89	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Mark Prod.	Giddings, Tex.	Massey-Graves #2	PMP	7/88	35	7,975	700	91.40	All	Unknown	No	n/a	FW, PM
Meridian	Basin Fruitland Coal, N.M.	Sunray H#201	C	89	14	3,230	1,854	94.00	1,008	1,088	Yes	13.35/100 ft	LS ND
Meridian	Basin Fruitland Coal, N.M.	SJ 32-5 Unit #100	C	89	14	2,995	1,600	97.00	1,135	1,135	Yes	14.42/100 ft	LS, ND
Meridian	Bicentennial, N.D.	31-35H	C	1/89	45	10,675	2,653	90.00	2,653	2,653	No	13/100 ft	OBM
Meridian	Bicentennial, N.D.	33-19H	F	6/88	78	10,796	1,533	90.00	1,533	1,533	No	13/100 ft	OBM
Meridian	Cinnamon Creek, N.D.	31-7H	F	12/88	51	10,667	2,399	90.00	2,399	2,399	No	13/100 ft	OBM
Meridian	E. Lookout Butte, Mont.	34-1H	P	11/88	37	8,827	1,347	90.00	1,347	1,347	No	13/100 ft	OBM
Meridian	E. Lookout Butte, Mont.	12-1H	P	6/88	39	8,811	1,436	90.00	1,436	1,436	No	13/100 ft	OBM
Meridian	E. Lookout Butte, Mont.	34-36H	P	9/88	43	8,939	1,617	90.00	1,617	1,617	No	13/100 ft	OBM
Meridian	Elkhorn Ranch, N.D.	33-11H	F	11/87	116	10,420	2,603	90.00	2,603	2,603	No	13/100 ft	OBM
Meridian	Elkhorn Ranch, N.D.	44-23H	F	10/88	47	10,340	2,692	90.00	2,692	2,692	No	13/100 ft	OBM
Meridian	Elkhorn Ranch, N.D.	34-29H	F	7/88	64	10,458	1,305	90.00	1,305	1,305	No	13/100 ft	OBM
Meridian	Hay Draw, N.D.	32-33H	F	11/88	58	10,535	2,571	90.00	2,571	2,571	No	13/100 ft	OBM
Meridian	Pennel, Mont.	13-11H	C	12/88	59	9,080	2,595	90.00	2,595	2,595	No	13/100 ft	OBM
Meridian	Pierre Creek, N.D.	43-36H	P	9/88	66	10,792	3,372	90.00	3,372	3,372	No	13/100 ft	OBM
Meridian	Roosevelt, N.D.	41-27H	F	12/88	56	10,233	1,112	90.00	1,112	1,112	No	13/100 ft	OBM
Mobil	Lower Spraberry, Tex.	John Snowden 7	TH	88	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Petrobras	Fazenda Belem, Brazil	9-FZB-446D-CE	P	9/88	20	1,253	2,904	94.00	2,031	853	No	1/5.5 m	SW
Sceptre Res.	North Tangleflags, Sask.	n/a	P	88	n/a	1,500	1,300	n/a	1,300	1,300	n/a	n/a	n/a
Shell	ERB West, Malaysia	126	P	10/88	56	6,920	5,791	92.70	±1,300	±1,100	Yes	3/100 ft	OBM
Standard	AWP, Tex.	Braune Wieding 1	PL	3/86	106	10,300	5,670	96.70	1,845	456	Yes	4/100 ft	OBM
Standard	Calvin-Dean, Tex.	M.V. Bryans A-7	PL/A	2/85	49	8,384	n/a	95.00	341	341	No	2.1/100 ft	Foam
Standard	Endicott, Off. Alaska	L-28	P	3/88	58	10,091	9,586	85.00	1,000	869	Yes	3.5/100 ft	OBM
Standard	Endicott, Off. Alaska	N-22	P	7/87	64	10,100	5,707	90.00	1,450	1,477	Yes	2.5/100 ft	PM
Standard	Endicott, Off. Alaska	K-33	P	12/87	69	10,180	8,090	86.00	1,640	802	Yes	2.5/100 ft	PM
Standard	Prudhoe Bay, Alaska	E-25	P	1/88	38	9,048	4,851	98.00	1,150	1,210	Yes	2.5/100 ft	OBM
Standard	Prudhoe Bay, Alaska	Y-25	P	12/88	43	9,035	7,446	92.50	1,918	1,802	No	2.5/100 ft	OBM
Standard	Prudhoe Bay, Alaska	G-23	P	1/87	25	9,054	2,375	86.00	941	520	Yes	4/100 ft	IBM
Standard	Prudhoe Bay, Alaska	Z-33	GI	89	n/a	n/a	n/a	n/a	n/a	n/a	Yes	2.5/100 ft	OBM
Standard	Prudhoe Bay, Alaska	J-25	P	8/87	30	8,999	3,152	94.00	2,170	2,126	Yes	4/100 ft	OBM
Standard	Prudhoe Bay, Alaska	F-23	P	12/86	41	9,063	6,086	89.00	1,160	980	No	2.5/100 ft	OBM
Standard	Prudhoe Bay, Alaska	J-X2	P	11/85	48	8,994	4,878	92.00	1,512	1,615	Yes	3/100 ft	Salt
Standard	Prudhoe Bay, Alaska	G-29	P	10/86	36	9,026	4,677	93.00	1,596	1,463	Yes	4/100 ft	OBM
Standard	Prudhoe Bay, Alaska	Y-8A	P	9/88	60	9,044	7,100	88.00	960	1,058	No	10/100 ft	OBM
Standard	Prudhoe Bay, Alaska	G-27	P	9/86	28	9,049	2,748	86.00	973	390	Yes	3.4/100 ft	IBM
Standard	Prudhoe Bay, Alaska	E-28	P	10/87	32	9,080	5,120	97.00	1,427	755	Yes	3.5/100 ft	IBM
Standard	Prudhoe Bay, Alaska	B-3B	P	8/87	38	9,009	4,315	91.00	1,021	869	No	8/100 ft	OBM
Standard	Prudhoe Bay, Alaska	W-42	GI	7/88	33	6,820	4,978	88.00	2,099	1,669	Yes	2.5/100 ft	OBM
Standard	Prudhoe Bay, Alaska	Y-20	P	5/86	33	9,000	9,515	91.00	1,196	1,163	Yes	2.5/100 ft	OBM
Standard	Prudhoe Bay, Alaska	B-30	SI	3/86	37	9,023	5,984	92.00	1,596	1,622	Yes	2.5/100 ft	Salt
Stewart Pet.	Alkali Lake, Colo.	Schock Fed. 1	E	9/88	22	4,186	1,751	90.40	1,641	963	No	10/100 ft	OBM
Unocal	Helder, Off. Nether.	A-2	P	1/88	19	4,716	1,910	89.30	479	146	Yes	7.1/30 m	LTox OBM
Unocal	Helder, Off. Neth.	A-3	P	12/87	17	4,706	1,639	91.60	869	265	Yes	11/30 m	LTox OBM
Unocal	Helder, Off. Neth.	A-4	P	12/86	33	4,709	2,759	91.60	440	134	Yes	10.6/30 m	LTox OBM
Unocal	Helder, Off. Neth.	A-5	P	4/87	12	4,731	3,323	90.70	1,348	411	Yes	7.4/30 m	LTox OBM
Unocal	Helder, Off. Neth.	A-7	P	3/87	15	4,719	4,089	91.60	1,093	333	Yes	9/30 m	LTox OBM
Unocal	Helder, Off. Neth.	A-8	P	4/88	14	4,716	4,998	92.20	0	246	Yes	7.9/30 m	LTox OBM
Unocal	Helder, Off. Neth.	A-10	P	6/88	15	4,723	2,437	90.70	1,240	378	Yes	11.1/30 m	LTox OBM
Unocal	Helder, Off. Neth.	A-11	P	6/88	11	4,708	1,865	91.10	738	225	Yes	9.2/30 m	LTox OBM
Unocal	Helder, Off. Neth.	A-12	P	7/88	12	4,701	2,796	94.50	1,355	413	Yes	5.38/30 m	LTox OBM
Unocal	Helder, Off. Neth.	B-1	P	5/87	17	4,737	1,365	92.60	689	177	Yes	13.7/30 m	LTox OBM
Unocal	P/9, Off. Neth.	P/9-6	S	12/87	45	6,819	1,831	89.50	1,335	407	Yes	3.92/30 m	LTox OBM
Union Pac.	Austin Chalk, Tex.	Court 2	C	12/88	40	±7,600	±1,500	92.00	1,650	1,650	No	20/100 ft	Water CRW
Western Min.	North Herald, Australia	3	P	10/87	n/a	3,940	2,389	n/a	n/a	n/a	n/a	n/a	n/a
Western Min.	South Pepper, Australia	6	P	12/87	n/a	4,047	3,603	n/a	n/a	n/a	n/a	n/a	n/a
Western Min.	South Pepper, Australia	7	P	12/87	n/a	4,044	3,619	n/a	n/a	n/a	n/a	n/a	n/a

*Core/reservoir. †Initial/recent.

used to drill two horizontal wells. The first was BP Exploration Co.'s Cyrus well in the North Sea, and the second is Amoco's Liuhua 11-1 well in the South China Sea. Next year Alcorn International Inc. is planning to drill a horizontal well in 1,050 ft of water in the Galoc field, offshore Phillipines.

Slotted liners are the most common way these wells are completed. A number though have now been successfully cemented and perforated.

Costs. Table 3 indirectly gives the cost of horizontal wells by comparing the total days on the well to vertical depth and horizontal displacement. In some developments such as Atlantic Richfield Indonesia Inc.'s Bima field, one can readily see that strides in efficiency can be obtained as more wells are drilled in a field.

In 1986, the Bima field wells were drilled in 16-35 days as compared to only 10-16 days in 1988.

In another example, Unocal spent 33 days in 1986 drilling its first horizontal well offshore The Netherlands, but were on a similar well only 12 days in 1988.

One savings in cost, difficult to calculate but one reason horizontal wells are drilled, is that these wells can reduce the total number of wells needed to produce a field, and increase the productivity of each well.

One such development is Elf Petroland BV's Zuidwal gas development. By combining three horizontal wells with six conventional directional wells, Elf was able to meet the contracted gas deliverabilty rates without having to drill all of the initially

Table 3

Reason for horizontal drilling	Completion	Artificial lift	Spacing, acre	Pay thickness, ft	Permability, md	Viscosity, cp	Temperature, °F.	Reservoir rock	Main reservoir heterogeneity	Oil production, b/d	Water production, bw/d	Gas production, Mcfd
PI	CL	n/a	40	400	.5-1	1	167	Ch	TL	2,949	6	4,099
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
IFS	SL, PKR	RP	33	n/a	n/a	n/a	60	Ch	F	12	50	260
IFS	n/a	n/a	320	20	n/a	n/a	n/a	Coal	F, Cleat	n/a	n/a	n/a
IFS	n/a	n/a	320	20	n/a	n/a	n/a	Coal	F, Cleat	n/a	n/a	n/a
IFS	SL	n/a	160	4-12	1.0	0	240	Sh	F	n/a	n/a	n/a
PI	SL	None	160	4-12	1.0	0	240	Sh	F	443	0	172
IFS	SL	None	160	4-12	1.0	0	240	Sh	F	125	0	109
Low perm	OH	RP	160	4-12	1.0	2	190	C	Low perm	115	205	65
Low perm	SL	RP	160	4-12	1.0	2	190	C	Low perm	221	55	110
Low perm	SL	RP	160	4-12	1.0	2	190	C	Low perm	178	83	89
IFS	SL	None	160	4-12	1.0	0	240	Sh	F	258	0	299
IFS	SL	None	160	4-12	1.0	0	240	Sh	F	95	n/a	50
PI	SL	None	160	4-12	1.0	0	240	Sh	F	332	n/a	367
IFS	SL	None	160	4-12	1.0	0	240	Sh	F	148	0	142
Low perm	OH	RP	160	4-12	1.0	2	190	C	Low perm	n/a	n/a	n/a
IFS	SL	U	160	4-12	1.0	0	240	Sh	F	253	0	209
IFS	SL	None	160	4-12	1.0	0	240	Sh	F	160	0	98
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
PI	SL	RP	10	98	4,000.0	1,500.0	105	US	Sh	189	56	n/a
WC	SL	RP	n/a	100	n/a	n/a	n/a	US	n/a	n/a	n/a	n/a
PI	CL	n/a	n/a	55	n/a	1	180	SS, Sh	Silty Sh	4,000	1,000	n/a
Pilot	SL	None	n/a	30	1-20	n/a	256	S	Faulting	n/a	n/a	n/a
Pilot	OH	RP	n/a	10	0.20-.03	n/a	155	S, Sh	F, Disc Sh	4-5	5-6	n/a
CRG	SL, CL	None	160	340	2,000/500*	1	219	SS	Disc Sh	6,446/6801†	0/0	900/722
CRG	CL, Perf	None	160	340	2,000/500*	1	219	SS	Disc Sh	10,193/2,880†	0/0.6	649/678
CRG	CL, Perf	None	160	340	2,000/500*	1	219	SS	Disc Sh	6,268/3,109†	6.3/0.7	791/630
CRG	CL, Perf	GLA	80	216	45/17*	1	200	SS	Disc Sh	10,800/9,060†	1.8/0.6	782/726
CRG	SL, CL	GLA	160	88	124/55*	1	200	SS	Disc Sh	5,690	18	656
CRG	CL, Perf	GLA	80	206	45/17*	1	200	SS	Disc Sh	3,180/4,770†	5.7/0.4	671/2,696
Inj.	SL	None	160	n/a	26/9*	1	200	SS	Disc Sh	Gas inj		
CRG	SL, CL	GLA	80	220	186/83*	1	200	SS	Disc Sh	12,700/4,590†	0/0.5	699/2,116
CRG	CL, Perf	GLA	80	213	45/17*	1	200	SS	Disc Sh	4,830/3,710†	2.4/0.3	671/715
CRG	SL, CL	GLA	80	265	186/83*	1	200	SS	Disc Sh	11,680/1,030†	3.2/2.2	614/1,650
CRG	CL, Perf	GLA	80	213	45/17*	1	200	SS	Disc SH	10,700/3,160†	1.1/0.8	758/4,123
CRG	SL, CL	GLA	160	72	124/55*	1	200	SS	Disc Sh	4,890/2,010†	1.1/2.2	859/542
CRG	CL, Perf	GLA	80	211	45/17*	1	200	SS	Disc Sh	5,900/4,430†	2.5/2.4	595/2,892
CRG	CL, Perf	GLA	80	196	45/17*	1	200	SS	Disc Sh	14,650/3,650†	0.6/0.7	697/2,421
CRG	SL, CL	GLA	80	137	143/63*	1	200	SS	Disc Sh	8,230/2,390†	0/1.5	6,018/6,854
Inj.	SL	None	160	n/a	26/9*	1	200	SS	Disc Sh	Gas inj		
CRW	SL	GL	80	100	124/55*	1	200	SS	Disc Sh	2,000/2,060†	2.6/2.1	533/533
CRW	SL, CL	GLA	80	137	143/63*	1	200	SS	Disc Sh	9,651/1,600†	25.4/4.2	605/7,108
IFS	n/a	Swab	n/a	216	n/a	n/a	n/a	Sh,Si,Ca	Hom	n/a	0	na
Sweep, WC	PGPL	ESP	62	89	3,000.0	30	143	SS	Frly hom	586	1,400	n/a
Sweep, WC	PGPL	ESP	62	108	3,000.0	30	143	SS	Frly hom	1,260	315	n/a
Sweep, WC	PGPL	ESP	62	82	3,000.0	30	143	SS	Frly hom	2,090	30	n/a
Sweep, WC	PGPL	ESP	62	85	3,000.0	30	143	SS	Frly hom	2,036	20	n/a
Sweep, WC	PGPL	ESP	62	82	3,000.0	30	143	SS	Frly hom	1,343	75	n/a
Sweep, WC	PGPL	ESP	62	59	3,000.0	30	143	SS	Frly hom	1,837	1,655	n/a
Sweep, WC	PGPL	ESP	62	85	3,000.0	30	143	SS	Frly hom	1,887	56	n/a
Sweep, WC	PGPL	ESP	62	79	3,000.0	30	143	SS	Frly hom	1,768	192	n/a
Sweep, WC	PGPL	ESP	62	102	3,000.0	30	143	SS	Frly hom	2,556	306	n/a
Sweep, WC	PGPL	ESP	62	56	3,000.0	30	143	SS	Frly hom	1,279	208	n/a
PI, IFS	PGPL	None	n/a	541	0.1	3	167	FS	DP, TM	4,400	0	n/a
IFS	SL	RP	80	34	Nat Fracs	n/a	n/a	C,Ch	F	n/a	n/a	n/a
n/a	SL	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
n/a	SL	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
n/a	SL	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

planned 16 wells. The Zuidwal project contained the first horizontal wells in the world drilled for gas production. One unique feature is that one well has a staircase horizontal lateral. In other words, one horizontal drain was established at one level in the reservoir, then the well was drilled deeper before proceeding to another horizontal lateral.

Increase in productivity of horizontal wells is demonstrated by Unocal's Dutch wells. Because they were sidetracked from previously producing wells, they present a good example of how much production can increase.

After being sidetracked, well Helder A-2 had the poorest production increase of 422 bo/d and 70% water cut to 586 bo/d and 70.5% water cut. On the other hand, in well Helder A-12 the benefits are very pronounced. The production increased from 551 bo/d and 96.1% water cut to 2,556 bo/d and 10.7% water cut.

All of the other Helder wells also had substantial production increases with the oil production rate increasing two to four fold and the water cut decreasing dramatically (Table 2).

Horizontal drilling has obviously reached a high level of technological maturity. Information exchanges among enlightened operators, as reflected in this survey, should, as the body of knowledge grows, identify all the best conditions and applications for this technology.

Editor's note: Logging measurement tools and stimulation will be reported in the issue of Mar. 13. •

Annual refining survey

Debra A. Gwyn
Director of Editorial Surveys

FOR a better understanding of the survey the following information may be of help.

Calendar-day figures reported in this survey are the average volume a refinery unit processes each day including downtime used for turnarounds. This is actual total volume for the year divided by 365.

Stream-day figures represent the amount a unit can process when running full capacity for short periods.

This survey includes only facilities charging whole crude, plus lube plants not charging whole crude.

Totals. When an asterisk (*) appears beside a figure in the crude capacity columns, this indicates that the figure was not reported but has been converted into either a calendar-day or stream-day figure using the crude conversion factor of 0.95.

Legend. Hydrocracking includes those processes where 50% or more of the feed is reduced in molecular size; for hydrorefining 10% of the feed or less is reduced in molecular size; and for hydrotreating, essentially no reduction in molecular size of feed occurs.

Values for hydrogen volumes represent either generation or upgrading to 90+ % purity.

Cat reforming definitions are:

- Semiregenerative is characterized by shutdown to the reforming unit at specified intervals or at the operator's convenience for regeneration of catalyst in situ.
- Cyclic is characterized by continuous or continual regeneration of catalyst in situ in any one of several reactors that can be isolated from and returned to the reforming operation. This is accomplished without changing feed rate or octane.
- Other includes: Nonregenerative—catalyst replaced by fresh catalyst; continuous — continuous regeneration of a part of the catalyst in a special regenerator followed by continuous addition to the reactor; moving-bed catalyst systems.

Detailed U.S. breakdown by company, plant, and state starts next page. Included are:

- U.S. crude capacity and downstream production by states.
- Detailed U.S. survey.
- Inactive refineries.

Legend

Numbers identify processes in table

THERMAL PROCESSES
1. Gas-oil cracking
2. Thermal cracking
3. Visbreaking
4. Coking (fluid)
5. Coking (delayed)
6. Other

CAT CRACKING
1. Fluid
2. Other

CAT REFORMING
- Semiregenerative:
  1. Conventional catalyst
  2. Bimetallic catalyst
- Cyclic:
  3. Conventional catalyst
  4. Bimetallic catalyst
- Other:
  5. Conventional catalyst
  6. Bimetallic catalyst

CAT HYDROCRACKING
1. Distillate upgrading
2. Residual upgrading
3. Lube-oil manufacturing
4. Other

CAT HYDROREFINING
1. Residual desulfurizing
2. Heavy gas-oil desulfurizing
3. Cat-cracker and cycle-stock feed pretreatment
4. Middle distillate
5. Other

CAT HYDROTREATING
1. Pretreating cat-reformer feeds
2. Naphtha desulfurizing
3. Naphtha olefin or aromatics saturation
4. Straight-run distillate
5. Other distillate
6. Lube-oil "polishing"
7. Other

ALKYLATION
1. Sulfuric acid
2. Hydrofluoric acid

AROMATICS/ISOMERIZATION
1. BTX
2. Hydrodealkylation
3. Cyclohexane
4. C_4 feed
5. C_5 feed
6. C_5 and C_6 feed

HYDROGEN
1. Steam methane reforming
2. Steam naphtha reforming
3. Partial oxidation
4. Cryogenic
5. Other

Survey of operating refineries in the U.S. (state capacities as of January 1, 1989)

State	No. plants	— Crude capacity — b/cd	b/sd	Charge capacity, b/sd: Vacuum distillation	Thermal operations	— Cat cracking — Fresh feed	Recycle	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Production capacity, b/sd: Alky. Poly.	Aromatics-Isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Alabama	3	138,750	143,900	48,000	10,000	......	......	27,000	......	13,000	43,500	......	6,000	......	20,500	8.0	400
Alaska	6	217,000	234,437	6,000	14,000	......	......	12,000	9,000	......	12,000	......	6,500	......	8,000	12.8	......
Arizona	1	5,710	6,000	2,000	......	......	......	......	......	......	......	......	......	......	1,160	......	......
Arkansas	3	58,570	61,000	30,500	......	18,500	775	9,000	......	......	20,000	4,800	3,000	4,000	9,700	2.8	......
California	31	2,278,593	2,418,930	1,350,265	503,200	645,500	14,000	561,500	385,000	525,000	948,450	127,200	19,700	29,900	94,754	997.4	20,092
Colorado	2	72,000	76,000	23,000	......	23,000	1,000	16,500	......	......	26,500	3,800	......	......	7,400	......	......
Delaware	1	140,000	150,000	95,000	46,000	65,000	5,000	56,000	19,000	......	110,000	13,500	3,370	......	......	40.0	2,180
Georgia	2	36,800	40,000	5,000	......	......	......	......	......	......	......	......	......	......	27,500	......	......
Hawaii	2	129,500	135,000	68,000	13,000	22,000	......	12,000	16,000	......	14,500	5,625	1,500	......	1,300	19.5	......
Illinois	6	920,600	977,000	361,000	106,400	342,000	12,400	294,300	66,000	35,000	546,800	91,000	30,200	4,600	36,600	66.8	6,300
Indiana	4	422,900	441,000	232,200	28,500	159,000	4,000	99,000	......	80,000	152,800	33,900	36,000	6,400	43,500	......	1,550
Kansas	8	344,025	363,583	124,650	55,690	127,000	5,000	98,300	......	44,000	165,300	39,100	43,469	2,500	9,000	......	2,070
Kentucky	2	218,900	226,300	92,000	57,600	100,000	......	53,000	......	40,000	142,300	13,000	17,600	7,900	30,000	20.0	......
Louisiana	17	2,274,515	2,374,300	908,300	408,500	736,500	13,300	494,300	149,000	301,000	942,600	202,200	79,300	37,000	55,500	162.6	14,775
Michigan	4	120,100	127,095	30,000	......	45,500	1,300	33,500	......	19,800	40,000	9,600	6,000	......	10,000	......	......
Minnesota	2	285,600	299,220	192,000	58,000	78,000	1,000	55,500	......	86,500	127,000	19,150	23,300	......	49,000	20.0	2,800
Mississippi	5	358,600	378,879	285,600	70,000	72,000	2,000	95,800	68,000	194,000	59,800	19,700	5,500	5,000	40,600	217.5	3,450
Montana	4	137,200	143,000	55,250	7,700	50,600	7,700	35,500	4,900	14,000	100,200	11,670	5,800	......	23,500	19.3	435
Nevada	1	4,500	4,700	2,500	......	......	......	......	......	......	......	......	......	......	......	......	......
New Jersey	6	464,250	486,368	249,400	31,500	256,000	25,000	89,500	......	65,000	270,600	30,500	43,000	8,500	73,000	11.0	1,010
New Mexico	3	72,800	77,107	13,900	......	27,100	6,600	17,400	......	......	29,100	5,400	4,000	......	4,100	......	......
New York	1	42,750	45,000	27,000	......	......	......	......	......	......	......	......	......	......	17,000	......	......
North Dakota	1	58,000	60,000	......	......	26,000	5,200	12,100	......	......	16,600	5,100	4,000	......	......	......	......
Ohio	4	482,650	508,000	163,000	29,900	176,000	8,800	160,600	86,200	23,000	169,500	26,600	65,400	2,100	19,000	65.0	1,250
Oklahoma	6	387,500	404,316	141,400	20,500	136,500	5,840	91,000	5,000	20,000	137,000	36,100	29,400	9,500	18,100	10.0	1,040
Oregon	1	15,000	15,789	16,000	......	......	......	......	......	......	......	......	......	......	11,500	......	......
Pennsylvania	8	730,400	768,000	320,180	......	239,300	6,800	208,820	51,000	50,000	430,900	49,000	21,050	21,310	43,000	49.5	......
Tennessee	1	57,000	60,000	12,000	......	30,000	......	10,000	......	......	31,000	5,500	4,000	......	3,500	......	......
Texas	31	4,058,350	4,294,500	1,826,300	355,000	1,616,500	134,250	1,150,900	276,500	827,000	2,249,950	301,750	304,215	88,800	67,400	614.0	11,694
Utah	6	154,500	160,400	45,500	8,500	55,400	9,100	29,100	......	7,100	35,100	14,500	8,050	......	1,700	......	350
Virginia	1	51,000	53,000	29,000	13,500	27,500	2,000	9,750	......	......	25,500	2,400	......	......	......	......	750
Washington	7	469,675	489,517	220,500	70,000	102,500	13,000	119,800	52,000	25,500	180,000	27,300	4,250	......	16,600	80.0	3,500
West Virginia	2	15,500	16,000	10,850	......	......	......	4,900	4,500	......	3,900	......	......	5,559	......	1.2	......
Wisconsin	1	32,000	34,000	20,500	......	11,000	1,000	8,000	......	5,800	9,000	1,300	......	......	13,500	......	......
Wyoming	5	163,500	171,500	75,600	6,600	64,500	10,000	36,850	......	21,000	59,950	10,700	1,800	1,500	6,000	......	......
Total	**188**	**15,418,738**	**16,243,841**	**7,082,395**	**1,914,090**	**5,252,900**	**295,065**	**3,901,920**	**1,192,100**	**2,396,700**	**7,099,850**	**1,110,395**	**778,404**	**234,569**	**782,414**	**2,417.4**	**73,646**

U.S. refineries: location, capacities, types of processing

Company and location	Crude capacity		Vacuum distillation	Thermal operations	Charge capacity, b/sd						Production capacity, b/sd				Hydrogen (MMcfd)	Coke (t/d)
	b/cd	b/sd			Cat cracking Fresh feed	Cat cracking Recycle	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt		
ALABAMA																
Belcher Refining Co.—Mobile Bay	*14,250	15,000	14,000	......	......	......	......	......	......	......	......	......	......	10,000	......	......
Hunt Refining Co.—Tuscaloosa	44,500	47,600	14,000	^{5}10,000	......	......	^{2}6,000	......	^{2}9,000 ^{4}4,000	^{1}6,000 ^{3}1,500	......	......	......	10,500	^{1}8.0	400
Louisiana Land & Exploration Co.—Saraland	80,000	81,300	20,000	......	......	......	^{2}21,000	......	......	^{1}21,000 ^{7}15,000	......	^{6}6,000	......	......	......	......
Total	**138,750**	**143,900**	**48,000**	**10,000**	......	......	**27,000**	......	**13,000**	**43,500**	......	**6,000**	......	**20,500**	**8.0**	**400**
ALASKA																
ARCO Alaska Inc.—Kuparuk	12,000	12,000														
Prudhoe Bay	14,000	18,000	......	^{6}14,000	......	......	......	......	......	......	......	......	......	......	......	......
Chevron U.S.A. Inc.—Kenai	22,000	22,500	......	......	......	......	......	......	......	......	......	......	......	6,000	......	......
Mapco Alaska Petroleum—North Pole	90,000	*94,737	6,000	......	......	......	......	......	......	......	......	^{1}2,500	......	2,000	......	......
Petro Star Inc.—North Pole	7,000	7,200	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Tesoro Petroleum Corp.—Kenai	72,000	80,000	......	......	......	......	^{4}12,000	^{2}9,000	......	^{1}12,000	......	^{6}4,000	......	......	^{1}12.8	......
Total	**217,000**	**234,437**	**6,000**	**14,000**	......	......	**12,000**	**9,000**	......	**12,000**	......	**6,500**	......	**8,000**	**12.8**	......
ARIZONA																
Intermountain Refining Cl—Fredonia	**5,710**	**6,000**	**2,000**	......	......	......	......	......	......	......	......	......	......	**1,160**	......	......
ARKANSAS																
Berry Petroleum Co.—Stevens	3,800	4,000	1,500	......	......	......	......	......	......	......	......	......	......	1,000	......	......
Cross Oil & Refining Co. of Arkansas—Smackover	6,770	7,000	4,000	......	......	......	......	......	......	^{6}4,500	......	......	4,000	2,200	^{1}2.8	......
Lion Oil Co.—El Dorado^{1}	48,000	50,000	25,000	......	^{1}18,500	775	^{2}9,000	......	......	^{1}10,000 ^{5}5,500	^{1}4,800	^{6}3,000	......	6,500	......	......
Total	**58,570**	**61,000**	**30,500**	......	**18,500**	**775**	**9,000**	......	......	**20,000**	**4,800**	**3,000**	**4,000**	**9,700**	**2.8**	......

Solvent extraction: ^{1}5,500 b/d.

Company and location	Crude capacity b/cd	Crude capacity b/sd	Vacuum distillation	Thermal operations	Cat cracking Fresh feed	Cat cracking Recycle	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
CALIFORNIA																
Anchor Refining Co Inc.—McKittrick	10,000	11,000	7,000	......	......	......	......	......	......	......	......	......	......	......	......	......
Atlantic Richfield Co.—Carson	214,000	225,000	112,000	^{5}56,000	^{1}82,000	......	^{2}48,000	^{1}22,000	......	^{1}40,000 ^{4}18,000 ^{5}8,000 ^{7}80,000	^{1}9,000 *3,000	......	......	......	^{1}70.0	2,500
Chemoil Refining Corp.—Signal Hill	14,400	16,000	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Chevron U.S.A. Inc.—El Segundo	330,000	380,000	179,000	^{4}54,000	^{1}60,000	......	^{2}60,000	^{1}45,000	^{1}24,000 ^{2}60,000 ^{4}14,000	^{1}56,000 ^{4}18,000	^{1}8,000	^{1}1,500	......	......	^{2}112.0	2,900
Richmond^{1}	270,000	280,000	175,000	......	^{1}63,000	......	^{2}68,000	^{1}45,000 ^{2}30,000 ^{3}30,500	^{2}60,000 ^{4}65,000	^{1}63,000 ^{6}18,200	^{1}9,200 *2,100	......	11,800	11,000	^{1}135.0	......
Conoco Inc.—Santa Maria	9,500	10,000	7,800	......	......	......	......	......	......	......	......	......	......	6,800	......	......
Edgington Oil Co. Inc.—Long Beach	41,600	44,730	21,165	......	......	......	......	......	......	......	......	......	......	15,554	......	......
Exxon Co.—Benicia	128,000	132,000	67,000	^{4}27,500	^{1}64,000	11,000	^{3}28,000	^{1}29,500	^{1}37,000	^{1}22,500 ^{2}22,000 ^{4}12,500 ^{5}12,500 ^{7}17,000	^{1}14,000 *2,000	......	......	......	^{1}104.0	1,100

Company and location	Crude capacity		Charge capacity, b/sd								Production capacity, b/sd				Hydrogen (MMcfd)	Coke (t/d)
	b/cd	b/sd	Vacuum distillation	Thermal operations	Cat cracking Fresh feed	Cat cracking Recycle	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt		
Fletcher Oil & Refining Co.—Carson	26,500	27,000	......	......	^{1}10,500	1,000	^{4}5,000	......	^{2}11,500	^{1}5,000	......	......	......	......	......	......
Golden Bear Division, Witco Chemical Corp.—Oildale	10,818	11,500	10,700	......	......	......	......	......	......	^{6}950	......	......	4,800	4,000	......	......
Golden West Refining Co.—Santa Fe Springs	40,600	42,300	25,000	^{1}13,800	^{1}13,500	......	^{2}19,000	^{1}11,000	......	^{2}12,000	^{2}3,000	......	......	4,000	^{1}11.0	......
Huntway Refining Co.—Benicia	8,400	9,000	7,500	......	......	......	......	......	......	......	......	......	......	4,500	......	......
Wilmington	5,500	6,000	5,000	......	......	......	......	......	......	......	......	......	......	3,500	......	......
Kern Oil & Refining Co.—Bakersfield	20,000	22,000	......	......	......	......	^{2}3,000	......	......	^{1}4,500	......	......	......	......	......	......
Lunday-Thagard Co.—South Gate	7,700	8,100	4,200	......	......	......	......	......	......	......	......	......	......	2,400	......	......
Mobil Oil Corp.—Torrance	123,000	130,000	95,000	^{5}48,000	^{1}63,000	......	^{2}36,000	^{1}21,700	^{3}68,000	^{1}21,000 ^{3}16,000 ^{4}28,000	^{2}17,000	......	......	......	^{1}137.0	2,900
Newhall Refining Co. Inc.—Newhall	18,800	20,000	10,000		......	......	^{2}2,500	......	......	^{1}2,500 ^{4}7,000	......	......	......	5,000	......	......
Oxnard Refinery—Oxnard	*4,275	4,500	......	......			......	......	......	......	......	......	......	3,000	......	......
Pacific Refining Co.—Hercules	*52,250	55,000	17,000	^{3}12,000			^{2}15,000	^{1}3,500	......	^{1}15,000	......	......	......	......	......	......
Paramount Petroleum Corp.—Paramount	42,700	46,500	29,000				^{2}10,500		^{2}11,000	^{2}11,000 ^{4}7,000	......	......	......	15,000	......	......
Powerine Oil Co.—Santa Fe Springs	*46,550	49,000	24,800	^{5}10,400	^{1}12,500		^{2}8,500	^{1}8,000	^{3}13,500 ^{4}6,000	^{1}8,500 ^{7}5,000	^{2}3,200	^{4}1,800	......	4,000	^{1}19.0	470
San Joaquin Refining Cl—Bakersfield	18,000	20,000	14,000	^{3}10,000			......	......	......	......	......	......	4,000	5,000	......	......
Shell Oil Co.—Martinez	140,100	143,000	96,500	^{4}22,000	^{1}67,000	1,000	^{1}28,000	^{1}27,000	^{3}50,000	^{2}17,000 ^{3}16,000 ^{5}19,000 ^{6}6,300 ^{7}15,000	^{1}8,000 *3,200	......	4,500	11,000	^{1}110.0	127
Wilmington	144,000	149,000	75,000	^{5}53,000	^{1}42,000		^{2}24,000			^{2}25,000 ^{3}14,000 ^{5}34,000 ^{7}32,000	^{1}8,600			......	^{1}36.0	2,500
Sunland Refining Corp.—Bakersfield	15,000	15,000					^{2}1,500			^{2}1,500	......			......	......	......
Texaco Refining & Marketing Inc.—																
Bakersfield	47,000	48,000	23,000	^{5}11,800			^{2}23,000	^{1}14,300	^{2}15,000	^{1}14,000					^{1}21.0	625
Wilmington	75,000	78,400	42,000	^{5}48,000	^{1}28,000		^{2}38,000	^{1}20,000		^{1}18,000 ^{4}12,000	^{1}4,400				^{3}48.0	1,650
Tosco Corp.—Martinez	126,000	132,600	105,000	^{4}42,000	^{1}55,000	1,000	^{2}20,000 ^{5}23,000	^{1}23,000	^{2}50,000	^{1}13,500 ^{4}28,000	^{1}12,000				^{1}80.0	1,500
Union Pacific Resources—Wilmington	68,000	72,000	42,000	^{5}24,000	^{1}38,000		^{6}14,500		^{3}40,000	^{1}15,000	^{2}10,500	^{4}9,000			......	1,200
Unocal Corp.—Los Angeles	108,000	111,000	83,000	^{3}20,000	^{1}47,000		^{2}52,000	^{2}22,000		^{1}54,000 ^{5}36,000	^{1}10,000				^{1}49.4	......
Rodeo	112,900	120,300	72,600	^{5}50,700			^{2}34,000	^{1}32,500		^{1}23,000 ^{5}9,500 ^{6}14,500		^{4}7,400	4,800		^{1}65.0	2,620
Total	**2,278,593**	**2,418,930**	**1,350,265**	**503,200**	**645,500**	**14,000**	**561,500**	**385,000**	**525,000**	**948,450**	**127,200**	**19,700**	**29,900**	**94,754**	**997.4**	**20,092**

Solvent extraction: ^{1}50,000 b/sd

COLORADO

Company and location	b/cd	b/sd	Vacuum distillation	Thermal operations	Cat cracking Fresh feed	Cat cracking Recycle	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Colorado Refining Co.—Commerce City	28,000	30,000	10,000		^{1}8,000		^{2}9,000			^{1}9,000	*1,200			3,400		
Conoco Inc.—Commerce City	44,000	46,000	13,000		^{1}15,000	1,000	^{2}7,500			^{1}7,500 ^{4}10,000	*2,600			4,000		
Total	**72,000**	**76,000**	**23,000**	......	**23,000**	**1,000**	**16,500**	......	......	**26,500**	**3,800**	......	......	**7,400**	......	......

Company and location	Crude capacity b/cd	Crude capacity b/sd	Charge capacity, b/sd Vacuum distillation	Thermal operations	Cat cracking Fresh feed	Cat cracking Recycle	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Production capacity, b/sd Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
DELAWARE																
Star Enterprise—Delaware City	140,000	150,000	95,000	^{4}46,000	^{1}65,000	5,000	^{2}18,000 ^{3}38,000	^{4}19,000	......	^{1}55,000 ^{4}55,000	^{1}8,000 *5,500	^{1}2,900 ^{2}470	......	......	^{1}40.0	2,180
Total	**140,000**	**150,000**	**95,000**	**46,000**	**65,000**	**5,000**	**56,000**	**19,000**	......	**110,000**	**13,500**	**3,370**	......	......	**40.0**	**2,180**
GEORGIA																
Amoco Oil Co.—Savannah	28,000	30,000	......	......	......	......	......	......	......	......	......	......	......	22,500	......	......
Young Refining Corp.—Douglasville	8,800	10,000	5,000	......	......	......	......	......	......	......	......	......	......	5,000	......	......
Total	**36,800**	**40,000**	**5,000**	......	......	......	......	......	......	......	......	......	......	**27,500**	......	......
HAWAII																
Chevron U.S.A. Inc.—Barber's Point	48,000	50,000	28,000	......	^{1}22,000	......	......	......	......	^{3}3,500	^{1}4,500 †1,125	^{6}1,500	......	1,300	^{1}2.5	......
Hawaiian Independent Refinery Inc.—Ewa Beach	81,500	85,000	40,000	^{5}13,000	......	......	^{2}12,000	^{1}16,000	......	^{1}11,000	......	......	......	......	^{2}17.0	......
Total	**129,500**	**135,000**	**68,000**	**13,000**	**22,000**	......	**12,000**	**16,000**	......	**14,500**	**5,625**	**1,500**	......	**1,300**	**19.5**	......

†Dimersol.

Company and location	Crude capacity b/cd	Crude capacity b/sd	Charge capacity, b/sd Vacuum distillation	Thermal operations	Cat cracking Fresh feed	Cat cracking Recycle	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Production capacity, b/sd Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
ILLINOIS																
Clark Oil & Refining Corp.—Blue Island	64,600	68,000	27,000	......	^{1}25,000	1,000	^{2}30,500	^{1}9,500	......	^{1}20,500	^{2}6,000	......	......	4,500	......	......
Hartford	60,000	65,000	18,000	^{5}14,500	^{1}26,000	1,000	^{2}12,000	......	......	^{1}12,000 ^{2}4,000 ^{4}4,000 ^{5}8,000	^{2}8,000	^{6}4,000	......	......	^{1}2.5	750
Marathon Petroleum Co.—Robinson	195,000	205,000	62,000	^{3}4,000 ^{5}22,000	^{1}41,000	400	^{4}38,000 ^{5}41,000	^{1}23,000	^{5}6,000	^{1}65,000 ^{4}11,500	^{2}12,000	^{6}11,500	......	......	^{1}25.0	1,200
Mobil Oil Corp.—Joliet	180,000	200,000	88,000	^{5}38,000	^{1}98,000	......	^{2}46,000	......	......	^{1}72,000 ^{2}9,000 ^{5}75,000	^{2}25,000	......	......	......	......	2,350
Shell Oil Co.—Wood River	274,000	286,000	108,000	......	^{1}94,000	......	^{2}22,000 ^{3}75,000	^{1}33,500	^{3}29,000	^{2}64,000 ^{5}52,500 ^{6}10,500 ^{7}35,000	^{1}22,000	^{1}3,800	4,600	28,500	^{1}28.3	......
Unocal Corp.—Lemont	147,000	153,000	58,000	^{5}27,900	^{1}58,000	10,000	^{2}29,800	......	......	^{1}29,800 ^{2}22,200 ^{3}6,400 ^{5}39,000 ^{7}2,100 ^{7}4,300	^{2}18,000	^{1}3,500 ^{6}7,400	......	3,600	^{1}11.0	2,000
Total	**920,600**	**977,000**	**361,000**	**106,400**	**342,000**	**12,400**	**294,300**	**66,000**	**35,000**	**546,800**	**91,000**	**30,200**	**4,600**	**36,600**	**66.8**	**6,300**

Company and location	Crude capacity		Charge capacity, b/sd								Production capacity, b/sd				Hydrogen	Coke
	b/cd	b/sd	Vacuum distillation	Thermal operations	Cat cracking — Fresh feed	Cat cracking — Recycle	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly	Aromatics-isomerization	Lubes	Asphalt	(MMcfd)	(t/d)
INDIANA																
Amoco Oil Co.—Whiting	350,000	360,000	203,000	^{5}28,500	^{1}140,000	4,000	^{3}85,000		^{3}80,000	^{1}87,000 ^{5}42,000 ^{6}4,300	^{1}26,000	^{1}13,000 ^{6}21,000	6,400	40,000	......	1,550
Indiana Farm Bureau Cooperative Association Inc.—Mt. Vernon	20,600	21,500	7,200		......	......	^{2}4,000	......	......	^{2}6,000	^{2}1,700	^{6}2,000	......	......	......	......
Laketon Refining Corp.—Laketon	8,300	10,000	5,000		......	......	......	......	......	......	......	......	......	3,500	......	......
Rock Island Refining Corp.—Indianapolis[1]	44,000	49,500	17,000	......	^{1}19,000	......	^{2}10,000	......	......	^{1}13,500	^{2}6,200	......	......	......	......	......
Total	**422,900**	**441,000**	**232,200**	**28,500**	**159,000**	**4,000**	**99,000**	......	**80,000**	**152,800**	**33,900**	**36,000**	**6,400**	**43,500**	......	**1,550**

Solvent extraction: ^{1}4,500

Company and location	b/cd	b/sd	Vacuum distillation	Thermal operations	Cat cracking — Fresh feed	Cat cracking — Recycle	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
KANSAS																
Coastal Refining and Marketing Inc.—Augusta	......	......	......	......	......	......	^{2}10,000	......	......	^{1}13,000	......	^{6}6,000	......	......	......	......
Derby Refining Co.—El Dorado[1]	*28,500	30,000	10,000	......	^{1}14,500	......	^{2}4,500	......	......	^{4}4,000	^{1}2,800	......	......	2,500	......	......
Wichita	*29,925	31,500	10,000	^{5}5,500	^{1}19,000	......	^{2}6,500	......	......	^{1}7,000	^{2}2,800 *3,500	......	......	......	......	210
Farmland Industries Inc.—Coffeyville	56,500	60,723	19,500	^{5}12,000	^{1}23,000	1,500	^{2}16,000	......	......	^{1}26,500	^{2}6,000	^{6}8,000	2,500	......	......	600
Phillipsburg	26,400	27,460	10,000	......	......	......	^{5}5,300	......	......	^{1}7,500	......	......	......	2,000	......	......
National Cooperative Refinery Association—McPherson	70,900	75,000	27,000	^{5}22,000	^{1}20,000	1,000	^{2}15,000	......	......	^{1}10,000 ^{2}14,500 ^{4}13,000	^{2}6,000	^{4}2,000 ^{6}9,500	......	......	......	650
Texaco Refining & Marketing Inc.—El Dorado	78,200	82,900	32,000	^{5}13,000	^{1}31,500	2,500	^{2}25,000	......	^{3}44,000	^{1}20,000 ^{2}20,000 ^{3}4,800 ^{4}9,000	^{2}12,500	^{1}2,969 ^{6}15,000	......	......	......	610
Total Petroleum Inc.—Arkansas City	53,600	56,000	16,150	^{1}3,190	^{1}19,000	......	^{2}16,000	......	......	^{1}16,000	^{2}5,500	......	......	4,500	......	......
Total	**344,025**	**363,583**	**124,650**	**55,690**	**127,000**	**5,000**	**98,300**	......	**44,000**	**165,300**	**39,100**	**43,469**	**2,500**	**9,000**	......	**2,070**

Solvent extraction: ^{1}4,500 b/sd.

Company and location	b/cd	b/sd	Vacuum distillation	Thermal operations	Cat cracking — Fresh feed	Cat cracking — Recycle	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
KENTUCKY																
Ashland Petroleum Co.—Catlettsburg	213,400	220,000	92,000	^{2}2,600 †^{6}55,000	^{1}60,000 §^{2}40,000	......	^{2}25,000 ^{5}27,000	......	^{3}40,000	^{1}60,000 ^{2}6,000 ^{3}6,000 ^{4}40,000 ^{7}5,000 ^{7}12,000 ^{7}12,000	^{2}12,000 *1,000	^{1}5,400 ^{6}12,000	7,900	30,000	^{1}20.0	......
Somerset Refinery Inc.—Somerset	5,500	6,300	......	......	......	......	^{5}1,000	......	......	^{1}1,300	......	^{6}200	......	......	......	......
Total	**218,900**	**226,300**	**92,000**	**57,600**	**100,000**	......	**53,000**	......	**40,000**	**142,300**	**13,000**	**17,600**	**7,900**	**30,000**	**20.0**	......

†ART. §Reduced crude converter.

LOUISIANA

Company and location	Crude capacity b/cd	Crude capacity b/sd	Charge capacity, b/sd: Vacuum distillation	Thermal operations	Cat cracking Fresh feed	Cat cracking Recycle	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Production capacity, b/sd: Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Atlas Processing Co., Division of Pennzoil—Shreveport	46,200	50,000	24,300	......	......	......	^{2}10,000	......	......	^{1}10,000 ^{6}3,400 ^{7}1,200 ^{7}5,500	......	......	8,500	600	^{1}6.1	......
Calcasieu Refining Co.—Lake Charles	12,000	13,500	......	......	......	......		......	......	......	......			......	......	......
Calumet Refining Co.—Princeton	4,100	4,400	8,000	......	......	......	......	......	......	......	......	......	3,000	1,000	......	......
Canal Refining Co.—Church Point	9,865	10,000	......	......	......	......	^{1}1,900	......	......	......	......	......	......	......	......	......
Citgo Petroleum Corp.—Lake Charles	320,000	330,000	83,000	^{5}63,000	^{1}150,000	......	^{2}46,000 ^{5}45,000	^{1}37,000	^{3}40,000	^{1}91,000 ^{4}14,000	^{1}20,200	......	9,000	......	......	3,000
Conoco Inc.—Westlake	156,500	164,000	63,000	^{2}12,000 ^{5}53,000	^{1}40,000	......	^{2}15,900 ^{5}11,500		......	^{1}33,000 ^{5}109,000 ^{7}13,500	^{1}7,500 *2,100	......	......	......	......	3,400
Exxon Co.—Baton Rouge[1]	455,000	474,000	205,000	^{5}90,000	^{1}155,000	......	^{4}90,000	^{1}24,000	......	^{1}95,000 ^{3}2,500 ^{5}55,000 ^{6}17,000 ^{7}2,000 ^{7}43,000	^{1}33,200 *8,000	^{5}7,500	16,500	28,900	......	4,980
Hill Petroleum Co.—Krotz Springs	55,300	57,500	24,000	......	^{1}28,000	......	^{2}12,500	......	......	^{1}12,500	*6,600	......	......	......	......	......
St. Rose	33,000	34,000	20,000	......	......	......	......	......	......	......	......	......	......	......	......	......
Kerr-McGee Refining Corp.—Cotton Valley	7,800	8,500	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Marathon Petroleum Co.—Garyville	255,000	263,000	125,000	......	^{1}85,000	1,000	^{5}48,000	......	^{2}71,000 ^{4}38,000	^{1}48,000 ^{4}16,000	^{2}26,000	^{4}18,500 ^{6}16,000	......	25,000	......	......
Mobil Oil Corp.—Chalmette	145,000	155,000	70,000	^{5}33,000	^{1}51,000	......	^{2}28,000 ^{5}19,000	^{1}18,000	^{3}43,000 ^{4}24,000	^{1}45,000	^{2}19,000	^{1}7,000	......	......	^{1}24.0	1,550
Murphy Oil USA Inc.—Meraux[2]	92,500	95,400	40,000	......	^{1}35,000	2,500	^{6}23,000	......	^{4}15,000	^{1}29,000	^{1}8,700	......	......	......	......	......
Placid Refining Co.—Port Allen[3]	*47,500	50,000	20,000	......	^{1}18,500	2,500	^{2}10,000	......	......	^{1}10,000	^{2}3,600	......	......	......	......	......
Shell Oil Co.—Norco	215,000	220,000	78,000	^{5}21,000 ^{6}17,700 ^{6}85,800	......	......	^{2}18,000 ^{3}38,000	^{1}35,000	^{3}70,000	^{2}29,000 ^{3}28,000	^{1}15,000 *9,400	......	......	......	^{1}70.0	1,000
Sohio Oil Co.(BP America)—Belle Chasse	*194,750	205,000	73,000	^{5}21,000	^{1}89,000	2,300	^{2}37,500	......	......	^{2}42,000 ^{4}24,000 ^{5}22,000	^{2}28,400	^{1}24,000 ^{2}6,300	......	......	......	845
Star Enterprise—Convent	225,000	240,000	75,000	^{3}12,000	^{1}85,000	5,000	^{2}40,000	^{2}35,000	......	^{1}40,000 ^{4}37,000 ^{5}65,000	^{1}14,500	......	......	......	^{3}62.5	......
Total	**2,274,515**	**2,374,300**	**908,300**	**408,500**	**736,500**	**13,300**	**494,300**	**149,000**	**301,000**	**942,600**	**202,200**	**79,300**	**37,000**	**55,500**	**162.6**	**14,775**

Solvent extraction: ^{1}28,500 b/sd. ^{2}12,000 b/sd. ^{3}6,000 b/sd.

MICHIGAN

Company and location	Crude capacity b/cd	Crude capacity b/sd	Charge capacity, b/sd: Vacuum distillation	Thermal operations	Cat cracking Fresh feed	Cat cracking Recycle	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Production capacity, b/sd: Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Crystal Refining Co.—Carson City	4,000	6,200	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Lakeside Refining Co.—Kalamazoo	5,600	*5,895	......	......	......	......	^{1}1,000	......	......	......	......	......	......	......	......	......
Marathon Petroleum Co.—Detroit	68,500	71,000	30,000	......	^{1}27,000	1,300	^{2}18,500	......	^{3}14,000	^{1}21,000	^{1}4,000	......	......	......	......	......
Total Petroleum Inc.—Alma	42,000	44,000	......	......	^{1}18,500	......	^{2}14,000	......	^{2}3,800 ^{4}2,000	^{1}19,000	^{2}4,600 *1,000	^{6}6,000	......	10,000	......	......
Total	**120,100**	**127,095**	**30,000**	......	**45,500**	**1,300**	**33,500**	......	**19,800**	**40,000**	**9,600**	**6,000**	......	**10,000**	......	......

MINNESOTA

Company and location	Crude capacity b/cd	Crude capacity b/sd	Charge capacity, b/sd: Vacuum distillation	Thermal operations	Cat cracking Fresh feed	Cat cracking Recycle	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Production capacity, b/sd: Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Ashland Petroleum Co.—St. Paul Park	67,100	69,220	32,000	......	^{1}23,000	......	^{2}23,500	......	^{3}23,000	^{1}24,500 ^{4}7,200 ^{7}8,300	^{2}5,500 *350	^{6}8,300	......	14,000	......	......

Company and location	Crude capacity		Charge capacity, b/sd								Production capacity, b/sd					
					Cat cracking											
	b/cd	b/sd	Vacuum distillation	* Thermal operations	Fresh feed	Recycle	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Koch Refining Co.—Rosemount	*218,500	230,000	160,000	[5]58,000	[1]55,000	1,000	[6]26,000 [7]6,000	......	[3]63,500	[1]26,000 [2]15,000 [4]46,000	[1]8,500 *1,100 †3,700	[6]15,000	......	35,000	[1]20.0	2,800
Total	**285,600**	**299,220**	**192,000**	**58,000**	**78,000**	**1,000**	**55,500**	......	**86,500**	**127,000**	**19,150**	**23,300**	......	**49,000**	**20.0**	**2,800**

†Dimersol

MISSISSIPPI

Amerada-Hess Corp.—Purvis	30,000	*31,579	20,000	[4]8,000	[2]16,000	......	[2]5,800	......	......	[2]5,800 [4]6,000	[1]3,500	......	......	......	......	250
Chevron U.S.A. Inc.—Pascagoula	295,000	310,000	243,000	[5]62,000	[1]56,000	2,000	[2]90,000	[1]68,000	[1]96,000 [3]63,000 [4]30,000 [5]5,000	[1]48,000	[1]16,200	[1]5,500	......	20,000	[1]215.0	3,200
Ergon Refining Inc.—Vicksburg	16,800	18,300	15,600	......	......	......	......	......		......	......	......	5,000	12,000	[1]2.5	......
Southland Oil Co.—Lumberton	5,800	6,500	......	......	......	......	......	......	......	......	......	......	......	3,500	......	......
Sandersville	11,000	12,500	7,000	......	......	......	......	......	......	......	......	......	......	5,100	......	......
Total	**358,600**	**378,879**	**285,600**	**70,000**	**72,000**	**2,000**	**95,800**	**68,000**	**194,000**	**59,800**	**19,700**	**5,500**	**5,000**	**40,600**	**217.5**	**3,450**

MONTANA

Cenex—Laurel[1]	40,400	42,500	14,000	......	[1]12,000	3,000	[2]12,000	......	[4]14,000	[1]15,000	[2]3,000	[4]2,000	......	6,000	......	......
Conoco Inc.—Billings[2]	48,500	50,000	20,000	......	[1]15,500	1,000	[2]12,500	......	......	[4]38,000 [5]3,500	[2]5,000	[4]3,400	......	6,500	......	......
Exxon Co.—Billings	42,000	44,000	18,000	[4]7,700	[1]21,000	3,500	[1]10,000	[1]4,900	......	[2]15,500 [4]10,000 [5]10,000 [7]6,000	[2]3,400	......	......	11,000	[5]19.3	435
Montana Refining Co.—Great Falls	6,300	6,500	3,250	......	[1]2,100	200	[2]1,000	......	......	[1]1,000 [4]1,200	*270	[6]400	......	......	......	......
Total	**137,200**	**143,000**	**55,250**	**7,700**	**50,600**	**7,700**	**35,500**	**4,900**	**14,000**	**100,200**	**11,670**	**5,800**	......	**23,500**	**19.3**	**435**

Solvent extraction: [1]4,000 b/sd. [2]8,500 b/sd (PDA).

NEVADA

Nevada Refining Co.—Tonopah	**4,500**	**4,700**	**2,500**	......	......	......	......	......	......	......	......	......	......	......	......	......

NEW JERSEY

Amerada-Hess Corp.—Port Reading	......	......	......	......	[1]50,000	......	......	......	......		[1]4,500 *5,000	......	......	......	......	......
Chevron U.S.A. inc.—Perth Amboy	80,000	85,000	46,000	......	......	......	......	......	......	......	......	......	......	35,000	......	......
Coastal Eagle Point Oil Co.—Westville	*109,250	115,000	45,000	[3]10,000	[1]50,000	......	[2]38,000	......	......	[1]40,000 [4]30,000 [5]17,000 [7]4,800	[1]3,000 *2,500	[1]10,000 [2]6,000 †2,000	......	......	......	......
Exxon Co.—Linden	130,000	135,000	66,000	......	[1]120,000	25,000	[4]28,000	......	[2]50,000	[1]29,000 [2]19,000 [5]65,000	[1]10,500	[6]25,000	......	38,000	......	......
Mantua Oil Co. LP—Thorofare	45,000	*47,368	30,000	......	......	......	......	......	......	......	......	......	......	......	......	......

Company and location	Crude capacity b/cd	Crude capacity b/sd	Charge capacity, b/sd Vacuum distillation	Thermal operations	Cat cracking Fresh feed	Cat cracking Recycle	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Production capacity, b/sd Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Mobil Oil Corp.—Paulsboro[1]	100,000	104,000	62,400	[5]21,500	[1]36,000	......	[2]23,500	......	[5]15,000	[1]23,500 [5]42,000 [6]300	[2]5,000	......	8,500	......	[1]11.0	1,010
Total	**464,250**	**486,368**	**249,400**	**31,500**	**256,000**	**25,000**	**89,500**	......	**65,000**	**270,600**	**30,500**	**43,000**	**8,500**	**73,000**	**11.0**	**1,010**

Solvent extraction: [1]9,500 b/sd. †Cumene.

NEW MEXICO

Company and location	Crude capacity b/cd	Crude capacity b/sd	Vacuum distillation	Thermal operations	Cat cracking Fresh feed	Cat cracking Recycle	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Bloomfield Refining Co.—Bloomfield	16,800	18,107	......	......	[1]5,400	500	[2]2,800	......	......	[1]2,800	*2,000	......	......	......	......	......
Giant Industries Inc.—Gallup	18,000	19,000	7,900	......	[1]7,200	3,600	[2]6,800	......	......	[2]6,800	[2]1,400	[6]4,000	......	700	......	......
Navajo Refining Co.—Artesia	*38,000	40,000	6,000	......	[1]14,500	2,500	[2]7,800	......	......	[1]10,000 [4]6,500 [5]3,000	[2]2,000	......	......	3,400	......	......
Total	**72,800**	**77,107**	**13,900**	......	**27,100**	**6,600**	**17,400**	......	......	**29,100**	**5,400**	**4,000**	......	**4,100**	......	......

NEW YORK

Company and location	Crude capacity b/cd	Crude capacity b/sd	Vacuum distillation	Thermal operations	Cat cracking Fresh feed	Cat cracking Recycle	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Cibro Petroleum Products Co.—Albany	***42,750**	**45,000**	**27,000**	......	......	......	......	......	......	......	......	......	......	**17,000**	......	......

NORTH DAKOTA

Company and location	Crude capacity b/cd	Crude capacity b/sd	Vacuum distillation	Thermal operations	Cat cracking Fresh feed	Cat cracking Recycle	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Amoco Oil Co.—Mandan	58,000	60,000	......	......	[1]26,000	5,200	[4]12,100	......	......	[2]16,600	[2]3,400 *1,700	[6]4,000	......	......	......	......
Total	**58,000**	**60,000**	......	......	**26,000**	**5,200**	**12,100**	......	......	**16,600**	**5,100**	**4,000**	......	......	......	......

OHIO

Company and location	Crude capacity b/cd	Crude capacity b/sd	Vacuum distillation	Thermal operations	Cat cracking Fresh feed	Cat cracking Recycle	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Ashland Petroleum Co.—Canton	66,000	68,000	33,000	......	[1]25,000	......	[5]20,000	......	[3]23,000	[1]20,000 [4]7,000 [7]6,500	[2]7,000 *500	[6]6,500	......	12,000	......	......
Sohio Oil Co. (BP America)—Lima	*171,000	180,000	51,000	[5]16,200	[1]36,000	7,800	[4]53,000	[4]23,000	......	[1]59,000	......	[1]24,400 [2]6,500 [6]16,600	2,100	......	......	620
Toledo	*120,650	127,000	49,000	[5]13,700	[1]55,000	......	[3]23,000 [4]19,000	[4]35,000	......	[1]37,000	[1]11,300	......	......	7,000	[1]24.0	630
Sun Co. Inc.—Toledo[1]	125,000	133,000	30,000	......	[1]60,000	1,000	[2]45,600	[1]28,200	......	[1]40,000	[1]7,800	[1]9,000 [2]2,400	......	......	[1]41.0	......
Total	**482,650**	**508,000**	**163,000**	**29,900**	**176,000**	**8,800**	**160,600**	**86,200**	**23,000**	**169,500**	**26,600**	**65,400**	**2,100**	**19,000**	**65.0**	**1,250**

Solvent extraction: [1]9,000 b/sd.

OKLAHOMA

Company and location	Crude capacity b/cd	Crude capacity b/sd	Vacuum distillation	Thermal operations	Cat cracking Fresh feed	Cat cracking Recycle	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Barrett Refining Corp.—Thomas	13,000	*13,684	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Conoco Inc.—Ponca City	136,000	140,000	40,000	[5]20,500	[1]46,000	......	[2]34,500	......	......	[1]34,500 [5]24,000	[2]12,000 *2,100	[4]4,500	2,000	......	......	740
Kerr-McGee Refining Corp.—Wynnewood[1]	43,000	45,000	13,000	......	[1]20,000	......	[2]8,500	[1]5,000	......	[1]9,000	[2]5,000	[6]4,000	......	5,000	[1]10.0	......
Sinclair Oil Corp.—Tulsa	50,000	*52,632	26,500	......	[1]18,000	5,000	[2]12,000	......	......	[1]12,000 [5]5,000	[1]3,000	[4]500 [6]6,000	......	2,500	......	......
Sun Co. Inc.—Tulsa[2]	85,000	90,000	29,900	......	[1]30,000	840	[2]24,000	......	......	[1]24,000 [6]10,500	[2]7,000	[1]2,200 [2]1,200	7,500	4,600	......	300

Company and location	Crude capacity b/cd	Crude capacity b/sd	Charge capacity, b/sd Vacuum distillation	Thermal operations	Cat cracking Fresh feed	Cat cracking Recycle	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Production capacity, b/sd Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Total Petroleum Inc.—Ardmore	60,500	63,000	32,000	......	^{1}22,500	......	^{6}12,000	......	^{2}20,000	^{1}18,000	^{2}7,000	^{3}2,000 ^{4}3,000 ^{6}6,000	......	6,000	......	......
Total	**387,500**	**404,316**	**141,400**	**20,500**	**136,500**	**5,840**	**91,000**	**5,000**	**20,000**	**137,000**	**38,100**	**29,400**	**9,500**	**18,100**	**10.0**	**1,040**

Solvent extraction: ^{1}5,000 b/sd; ^{2}5,800 b/sd.

OREGON

Company and location	Crude capacity b/cd	Crude capacity b/sd	Vacuum distillation	Thermal operations	Cat cracking Fresh feed	Cat cracking Recycle	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Chevron U.S.A. Inc.—Portland	**15,000**	**15,789**	**16,000**	......	......	......	......	......	......	......	......	......	......	**11,500**	......	......

PENNSYLVANIA

Company and location	Crude capacity b/cd	Crude capacity b/sd	Vacuum distillation	Thermal operations	Cat cracking Fresh feed	Cat cracking Recycle	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Atlantic Refining & Marketing Corp.—Philadelphia	125,000	130,000	83,000	......	^{1}29,000	......	^{2}60,000	^{4}30,000	......	^{1}54,000 ^{4}50,000 ^{7}24,000	......	......	......	35,000	^{5}40.0	......
Chevron U.S.A. Inc.—Philadelphia	174,100	180,000	80,000	......	^{1}53,300	5,000	^{2}34,000	......	......	^{2}34,000 ^{4}30,000	^{2}20,000	^{1}4,000 ^{2}1,300	......	......	......	......
Kendall-Amalie Division, Witco Chemical Co.—Bradford	8,500	11,500	......	......	......	......	^{2}3,300	......	......	......	......	......	4,000	......	......	......
Pennzoil Products Co.—Rouseville	15,700	16,500	6,500	......	......	......	^{2}5,820	......	......	^{1}6,500 ^{6}7,800	......	^{6}1,150	4,750	......	^{1}3.5	......
Quaker State Oil Refining Corp.—Smethport^{1}	6,500	7,000	2,680	......	......	......	^{2}2,100	......	......	^{1}2,900	......	^{6}800	2,560	......	......	......
Sohio Oil Co. (BP America)—Marcus Hook	*171,000	180,000	75,000	......	^{1}50,000	1,600	^{6}48,000	^{4}21,000	^{3}50,000	^{1}64,000 ^{4}22,000 ^{5}22,000	^{2}12,000	......	......	......	......	......
Sun Co. Inc.—Marcus Hook	165,000	175,000	46,000	......	^{1}87,000	......	^{2}39,600	......	......	^{1}54,300 ^{4}14,400 ^{5}13,000 ^{6}6,000	^{1}12,000	^{1}7,000	10,000	......	^{1}6.0	......
United Refining Co.—Warren	*64,600	68,000	27,000	......	^{1}20,000	200	^{2}16,000	......	......	^{1}20,000 ^{4}6,000	^{1}3,000 *2,000	^{6}6,800	......	8,000	......	......
Total	**730,400**	**768,000**	**320,180**	......	**239,300**	**6,800**	**208,820**	**51,000**	**50,000**	**430,900**	**49,000**	**21,050**	**21,310**	**43,000**	**49.5**	......

Solvent extraction: ^{1}730 b/sd

TENNESSEE

Company and location	Crude capacity b/cd	Crude capacity b/sd	Vacuum distillation	Thermal operations	Cat cracking Fresh feed	Cat cracking Recycle	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Mapco Petroleum Inc.—Memphis	*57,000	60,000	12,000	......	^{1}30,000	......	^{2}10,000	......	......	^{1}10,000 ^{2}5,000 ^{5}16,000	^{2}3,000 *2,500	^{6}4,000	......	3,500	......	......
Total	**57,000**	**60,000**	**12,000**	......	**30,000**	......	**10,000**	......	......	**31,000**	**5,500**	**4,000**	......	**3,500**	......	......

TEXAS

Company and location	Crude capacity b/cd	Crude capacity b/sd	Vacuum distillation	Thermal operations	Cat cracking Fresh feed	Cat cracking Recycle	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Amoco Oil Co.—Texas City	420,000	440,000	195,000	^{5}41,000	^{1}195,000	43,000	^{4}160,000	^{1}55,500 ^{2}60,000	^{3}76,000	^{1}126,000 ^{5}70,000	^{1}19,000 ^{2}31,000	^{1}45,000 ^{6}27,000	......	......	^{1}180.0	2,175
Champlin Refining Co.—Corpus Christi	150,000	160,000	80,000	^{5}32,000	^{1}70,000	......	^{5}52,000	......	^{2}55,000	^{2}54,000	^{2}19,000	^{1}5,000	......	......	......	1,800
Chevron U.S.A. Inc.—El Paso	66,000	68,000	54,000	......	^{1}22,000	......	^{2}25,000	......	^{4}40,000 ^{4}18,000	^{1}25,000	^{1}5,500	^{3}2,500 ^{4}3,000	......	5,500	......	......

Company and location	Crude capacity b/cd	Crude capacity b/sd	Vacuum distillation	Thermal operations	Cat cracking Fresh feed	Cat cracking Recycle	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
					Charge capacity, b/sd						Production capacity, b/sd					
Port Arthur	329,000	338,000	163,200	[3]34,000	[1]110,000	6,000	[2]23,000 [4]44,100	......	......	[2]67,100 [4]138,000 [6]13,900	[2]16,900	[1]7,095 [2]2,905 [3]2,500 [5]7,200	10,000	......	......	1,840
Coastal Refining & Marketing Inc Corpus Christi	*90,250	95,000	53,000	[1]11,000 [5]12,000	[1]18,500	......	[2]11,000 [6]17,500	[1]10,000	......	[1]30,000 [4]20,000 [6]25,000	[2]3,200 *1,750	[1]11,000 [2]7,000 [5]5,300	......	10,000	[1]24.0 [4]15.0	650
Crown Central Petroleum Corp —Houston	100,000	105,000	40,000	[5]12,500	[1]56,000	......	[2]14,000 [5]22,000		[4]10,000	[1]26,000	[2]13,000	[1]2,000 [2]2,000	......	......	......	350
Diamond Shamrock Corp —Sunray[1]	105,000	107,000	47,000		[1]45,000	......	[2]29,000	[4]20,000	......	[1]33,000	[1]8,700 *4,600	......	......	5,000	......	......
Three Rivers[2]	50,000	52,000	20,000	......	[1]19,000	......	[2]11,000	......	......	[1]11,000	[2]6,000	......	1,000	......	......	......
El Paso Refining Co Ltd —El Paso	21,000	21,000	......	[5]4,000	[1]7,000	2,000	[2]5,600	......	......	[1]5,600	[1]2,500 *500	[4]500	......	......	......	100
Exxon Co U.S.A. —Baytown[3]	493,000	517,000	258,000	[4]28,000	[1]155,000	15,000	[3]60,000 [4]63,000	[1]19,000	[2]95,000	[1]139,000 [3]23,500 [4]143,000 [5]80,000 [6]44,100	[1]29,000		31,200	7,000	[1]85.0	100
Fina Oil & Chemical Co —Big Spring[4]	55,000	60,000	24,000		[1]22,000	......	[2]20,000	......	[2]6,000	[1]25,000 [4]3,000 [5]15,000	[2]5,000	[1]600	......	......	......	......
Port Arthur[5]	100,000	110,000	50,000		[1]36,000	......	[5]34,000	......	[2]18,000 [3]13,000	[1]40,000 [5]28,000	[1]5,000	[1]10,000 [6]8,500	......	2,000	......	......
Hill Petroleum Co —Houston[6]	67,500	70,000	27,000	......	[1]55,000	......	[2]11,500	......	......	[1]15,000 [4]22,500 [7]7,500	[1]5,500	[1]2,000	......	5,000	......	......
Texas City	119,600	130,000	54,000	[1]19,000	[1]43,500	......	[2]11,000 [5]12,000	......	[4]29,000	[1]23,000	[2]6,200	......	......	......	......	......
Howell Hydrocarbons Inc —San Antonio	2,750	2,900	......	......	......	......	[1]1,000	......	......	......	......	[1]1,000	—	......	......	......
Koch Refining Co —Corpus Christi	125,000	130,000	42,000	[5]12,000	[1]40,000	800	[3]15,000 [6]33,500	......	......	[1]49,500 [5]8,000	[2]8,400	[1]7,600 [2]3,200	—	......	......	375
LaGloria Oil & Gas Co —Tyler	55,000	60,000	16,000	[5]6,000	[1]17,000	850	[2]4,000 [5]11,700	......	......	[2]16,000	[1]4,800	[6]5,000	—	......	......	250
Liquid Energy Corp —Bridgeport	10,000	10,800	......	......	......	......	......	......	......	......	......	......	—	......	......	......
Lyondell Petrochemical Co —Houston[7]	265,000	286,000	129,000	[5]40,000	[1]90,000	......	[2]110,000	—	[3]48,000 [4]46,000 [5]35,000	[1]110,000 [3]10,000 [4]43,000 [7]7,000	[1]14,000	[1]11,000	6,000	......	......	2,650
Marathon Petroleum Co —Texas City	69,500	72,000	27,000	......	[1]38,000	1,000	[1]9,000	......	......	......	[2]11,000	[1]2,500	......	......	......	......
Mobil Oil Corp —Beaumont	275,000	290,000	86,000	[5]29,500	[1]102,000	......	[2]57,000 [5]46,000	[1]32,000	......	[1]92,000 [6]3,500 [7]116,000 [7]2,150	[1]13,000	[5]20,000	9,400	......	[1]60.0	1,404
Phillips 66 Co —Borger	105,000	110,000			[1]60,000	10,400	[2]26,000	......	[1]50,000 [4]40,000	[2]26,500	[2]14,000	[3]3,060 [4]11,000 [5]12,100 [6]12,500	......	......	[1]50.0	......
Sweeny	175,000	195,000	83,000		[1]87,000	12,000	[2]36,000	......	[1]75,000 [4]50,000	[2]53,000	[2]10,500	[1]5,575 [3]7,630 [5]9,100 [6]7,800	......	......	[4]80.0	......
Pride Refining Inc —Abilene	42,750	45,000	12,500	......	......	......	......	......	......	......	......	......	......	......	......	......
Shell Oil Co —Deer Park	215,900	227,000	89,500	[1]55,000 [6]19,000	[1]65,000	5,000	[2]20,000 [3]43,000	[4]65,000	[3]45,000	[2]64,000 [3]37,500 [6]11,500 [7]77,000	[1]8,100	[1]20,000	10,700	5,900	[1]65.0	......

					Charge capacity, b/sd						Production capacity, b/sd					
Company and location	– Crude capacity –		Vacuum distillation	Thermal operations	— Cat cracking —		Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
	b/cd	b/sd			Fresh feed	Recycle										
Odessa	28,600	29,500	10,000	......	^{1}10,500	......	^{1}11,000	......	......	^{2}11,000	^{1}3,300	^{1}350	......	......	......	......
Southwestern Refining Cl—Corpus Christi	104,000	108,000	36,000	......	^{1}50,000	......	^{2}30,000	......	^{2}18,000	^{1}40,000 ^{4}27,000	^{2}4,000 *4,200	^{1}6,500	......	......	......	......
Star Enterprise— Port Arthur and Port Neches^{8}	250,000	278,000	143,100	......	^{1}110,000	31,500	^{5}40,000	^{1}15,000	......	^{1}40,000 ^{4}80,000 ^{6}18,500	^{1}9,000	......	17,400	14,000	......	......
Trifinery—Corpus Christi	28,500	29,500	20,000	......	......	......	......	......	......	......	......	......	......	10,500	......	......
Unocal Corp.—(Beaumont), Nederland	120,000	126,300	43,000	......	^{1}39,000	4,000	^{1}12,000 ^{2}20,000	......	......	^{1}43,000 ^{3}10,600	^{1}4,200 *1,400	^{1}6,000 ^{3}1,200	3,100	2,500	......	....
Valero Refining Co.—Corpus Christi	20,000	21,500	24,000	......	†^{2}54,000	2,700	......	......	^{1}60,000	......	^{2}9,500	......	......	......	^{1}55.0	......
Total	**4,058,350**	**4,294,500**	**1,826,300**	**355,000**	**1,616,500**	**134,250**	**1,150,900**	**276,500**	**827,000**	**2,249,950**	**301,750**	**304,215**	**88,800**	**67,400**	**614.0**	**11,694**

Solvent extraction: ^{1}15,000 b/sd. ^{2}7,000 b/sd. ^{3}53,000 b/sd. ^{4}10,000 b/sd. ^{5}18,000 b/sd. ^{6}11,000 b/sd. ^{7}6,000 b/sd. ^{8}4,000 b/sd.
†Heavy oil cracker. §Dimersol.

UTAH

Amoco Oil Co.—Salt Lake City	40,000	41,500	......	......	^{1}18,000	4,000	^{4}7,600	......	......	^{1}7,600	^{1}4,000	^{4}3,000	......	......	......	......
Big West Oil Co.—Salt Lake City	24,000	25,000	3,800	......	^{2}5,000	1,000	^{2}5,000	......	......	^{1}6,000	^{2}1,500	^{6}1,700	......	......	......	......
Chevron U.S.A.—Salt Lake City	45,000	46,000	35,500	^{5}8,500	^{1}11,000 ^{2}7,000	 1,000	^{2}5,500	......	^{5}5,500	^{1}5,500	^{2}4,300	^{4}750	......	......	......	350
Crysen Refining Inc.—Woods Cross	12,500	13,400	3,000	......	......	......	^{2}3,000	......	......	^{1}3,000	......	......	......	......	......	......
Pennzoil Products Co.—Roosevelt	8,000	8,500	......	......	^{1}6,000	500	^{2}2,000	......	......	^{4}2,000	*2,600	......	......	......	......	......
Phillips 66 Co.—Woods Cross^{1}	25,000	26,000	3,200	......	^{2}8,400	2,600	^{4}6,000	......	^{4}1,600	^{2}11,000	^{2}2,100	^{6}2,600	......	1,700	......	......
Total	**154,500**	**160,400**	**45,500**	**8,500**	**55,400**	**9,100**	**29,100**	......	**7,100**	**35,100**	**14,500**	**8,050**	......	**1,700**	......	**350**

Solvent extraction: ^{1}5,000 b/sd.

VIRGINIA

Amoco Oil Co.—Yorktown	51,000	53,000	29,000	^{5}13,500	^{1}27,500	2,000	^{2}9,750	......	......	^{1}10,000 ^{5}15,500	*2,400	......	......	......	......	750
Total	**51,000**	**53,000**	**29,000**	**13,500**	**27,500**	**2,000**	**9,750**	......	......	**25,500**	**2,400**	......	......	......	......	**750**

WASHINGTON

Atlantic Richfield Co.—Ferndale	162,000	170,000	95,000	^{5}50,000	......	......	^{2}56,000	^{1}52,000	^{4}18,000	^{1}38,000	......	......	......	......	^{1}80.0	2,500
Chevron U.S.A. Inc.—Seattle	5,000	*5,263	6,000	......	......	......	......	......	......	......	......	......	......	5,000	......	......
Shell Oil Co.—Anacortes	84,000	88,000	36,000	......	^{1}41,000	7,000	^{3}25,000	......	^{3}7,500	^{2}32,000 ^{5,7}20,500	^{1}10,900	^{4}2,750	......	......	......	......
Sohio Oil Co. (BP America)—Ferndale	77,000	79,000	28,000	......	^{2}25,500	2,000	^{4}11,800	......	......	^{1}13,500 ^{4}15,000	^{2}5,900 *1,200	......	......	......	......	......
Sound Refining Inc.—Tacoma	11,900	12,754	6,000	......	......	......	......	......	......	......	......	......	......	3,600	......	......
Texaco Refining & Marketing Inc.— Anacortes^{1}	97,000	100,000	30,000	^{5}20,000	^{1}36,000	4,000	^{1}7,000 ^{2}14,000	......	......	^{1}22,000 ^{4}13,000 ^{5}15,000	^{1}8,000 *1,300	......	......	......	......	1,000

Company and location	– Crude capacity – b/cd	b/sd	Vacuum distillation	Thermal operations	— Cat cracking — Fresh feed	Recycle	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics-Isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
					Charge capacity, b/sd						Production capacity, b/sd					
U.S. Oil & Refining Co.—Tacoma	*32,775	34,500	19,500	......			[2]6,000	......	......	[1]6,000 [2]1,000 [4]4,000	......	[6]1,500	......	8,000	......	......
Total	**469,675**	**489,517**	**220,500**	**70,000**	**102,500**	**13,000**	**119,800**	**52,000**	**25,500**	**180,000**	**27,300**	**4,250**	......	**16,600**	**80.0**	**3,500**

Solvent extraction: [1]4,500 b/sd

WEST VIRGINIA

Company and location	b/cd	b/sd	Vacuum distillation	Thermal operations	Fresh feed	Recycle	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics-Isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Mid Atlantic Fuels Inc.—St. Mary's[1]	5,000	5,200	2,000		......	......	[1]1,500	......	......	......	......	......	1,119	......	......	......
Quaker State Oil Refining Corp.—Newell	10,500	10,800	8,850		......	......	[2]3,400	[1]4,500	......	[1]3,900	......	......	4,440	......	[1]1.2	......
Total	**15,500**	**16,000**	**10,850**	......	......	......	**4,900**	**4,500**	......	**3,900**	......	......	**5,559**	......	**1.2**	......

Solvent extraction: [1]900 b/sd

WISCONSIN

Company and location	b/cd	b/sd	Vacuum distillation	Thermal operations	Fresh feed	Recycle	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics-Isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Murphy Oil USA Inc.—Superior	**32,000**	**34,000**	**20,500**	......	**[1]11,000**	**1,000**	**[2]8,000**	......	**[4]5,800**	**[1]9,000**	**[2]1,300**	......	......	**13,500**	......	......

WYOMING

Company and location	b/cd	b/sd	Vacuum distillation	Thermal operations	Fresh feed	Recycle	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics-Isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Amoco Oil Co.—Casper	40,000	41,000	17,000	......	[1]13,500	2,700	[4]7,000	......	......	[1]7,100	[1]2,500	......	1,500	......	......	......
Frontier Oil & Refining Co.—Cheyenne	35,000	38,000	20,000	[5]6,600	[1]12,000	300	[2]6,600	......	......	[1]7,200 [5]5,400	[2]3,200	[4]1,800	......	......	......	......
Little America Refining Co.—Casper	22,000	24,000	8,600	......	[1]14,000	3,000	[4]6,000	......	......	[1]6,000 [2]3,750 [5]4,000	......	......	......	1,000	......	......
Sinclair Oil Corp.—Sinclair	54,000	55,000	30,000	......	[1]21,000	1,000	[2]14,500	......	[3]21,000	[1]14,500 [4]12,000	[1]3,500 *700	......	......	5,000	......	......
Wyoming Refining Co.—Newcastle	12,500	13,500	......		[2]4,000	3,000	[1]2,750	......	......	......	[2]800	......	......	......	......	......
Total	**163,500**	**171,500**	**75,600**	**6,600**	**64,500**	**10,000**	**36,850**	......	**21,000**	**59,950**	**10,700**	**1,800**	**1,500**	**6,000**	......	......

INACTIVE REFINERIES

1. Mountaineer Refining Co. Inc., La Barge, Wyo.—300 b/cd.

WORLDWIDE GAS PROCESSING

DEBRA A. GWYN
Director of Editorial Surveys

Capacities as of Jan. 1, 1989, and average production

		MMcfd		Production—1,000 gpd (average based on the past 12 months)								
Country	**No. plants**	**Gas capacity**	**Gas through-put**	**Ethane**	**Prop.**	**Isobut.**	**Process or unsplit butane**	**LP-gas mix**	**Raw NGL mix**	**Debut. nat. gaso.**	**Other**	**Total products**
United States												
Alabama	7	255.0	198.8		185.5		153.5	6.4		104.3		449.7
Alaska	3	3,333.5	3,326.2		3.5				2,140.1		16.6	2,160.2
Arkansas	4	933.0	580.6		3.0		4.0		74.4	6.0	3.0	90.4
California	34	999.7	690.2		479.8	48.6	273.4	79.8	170.3	284.5	11.5	1,347.9
Colorado	38	982.5	573.3		192.8		42.0	44.6	584.8	31.0	10.2	905.4
Florida	2	790.0	642.0	79.4	121.1	13.3	61.4			63.1		338.3
Kansas	24	5,562.5	3,587.1	226.6	840.8	117.8	448.9	0.9	749.3	363.8	1.6	2,749.7
Kentucky	2	71.0	67.5						169.3			169.3
Louisiana	77	18,921.1	11,069.9	1,285.6	1,116.8	346.6	461.2	35.6	5,719.8	674.4	322.6	9,962.6
Michigan	29	4,763.1	1,552.5		76.4			33.6	628.4	88.1	50.9	877.4
Mississippi	6	901.0	390.8		8.3		7.7		11.8	9.4	1.8	39.0
Montana	7	27.0	10.7		29.6	6.8	5.5	21.0	15.1	10.5	1.0	89.5
Nebraska	1	1.5	0.6						0.4			0.4
New Mexico	28	3,346.4	2,164.8	157.4	157.8	12.2	45.2		4,905.2	50.3	28.2	5,356.3
North Dakota	8	193.6	120.1		187.9		92.9	17.8	56.6	95.1	13.2	463.5
Oklahoma	101	4,613.5	2,846.6	740.0	775.7	109.5	283.1	798.4	4,181.9	316.6	234.8	7,440.0
Pennsylvania	2	14.0	7.9		4.1		3.3			3.9		11.3
Texas	311	16,786.0	10,918.3	3,715.1	3,938.7	564.0	1,635.9	447.6	15,301.4	1,603.8	1,994.4	29,200.9
Utah	12	522.5	281.5		76.5		24.2		160.4	45.8	115.4	422.3
West Virginia	7	397.0	320.2	231.9	137.9	22.6	43.3	88.2	255.8			779.7
Wyoming	39	3,333.0	2,497.3		268.5	12.9	193.1	56.4	2,377.6	735.6	1,673.9	5,318.0
Total U.S.	**742**	**66,746.9**	**41,846.9**	**6,436.0**	**8,604.7**	**1,254.3**	**3,778.6**	**1,630.3**	**37,502.6**	**4,486.2**	**4,479.1**	**68,171.8**
Abu Dhabi	5	1,602.0	1,269.0							546.0		546.0
Algeria	4	5,335.2	4,268.2					632.8			5,449.2	6,082.0
Argentina	13	1,344.8	1,322.1	694.9	406.8		267.0			425.3		1,794.0
Australia	5	2,573.0	1,376.0	279.0	441.0		249.0	610.3		1,058.5	850.0	3,487.8
Austria	1	17.5	13.7					26.7		28.4		55.1
Bahrain	1	168.0	155.0		115.0		100.0			152.0		367.0
Bangladesh	2	240.0	178.0								8.2	8.2
Bolivia	2	474.0	177.3		1.4	2.5		161.7		61.5	136.9	364.0
Brazil	10	437.8	414.7	6.1				618.9	239.4	142.5	49.4	1,056.3
Brunei	2	1,032.0	832.4		9.4				50.1	252.1		311.6
Canada												
Alberta	446	22,396.6	12,453.0	5,210.3	2,611.7	830.3	594.9	1,400.8	3,710.0	3,661.0	585.2	18,604.2
British Columbia	14	2,299.3	1,348.0		211.4	25.2	109.6			21.6	71.4	439.2
Northwest Territories	2	196.0	16.9									
Saskatchewan	24	295.1	194.2					12.9	104.7	0.3	18.0	135.9
Chile	2	470.0	423.0		190.0		120.0			106.0		416.0
China, Taiwan	4	271.0	123.8	38.5	27.6	1.5	17.5		8.7	14.3		108.1
Colombia	5	323.0	201.0	102.5	53.0		56.0	48.3		61.5		321.3
Denmark	1	450.0	240.0								100.0	100.0
Dominican Republic	1										277.2	277.2
Dubai	1	330.0	330.0								650.5	650.5
Ecuador	2	41.0	20.5					97.1		37.3		134.4
Egypt	8	1,320.0	1,188.0					664.4			1,288.6	1,953.0
France	1	570.0	563.0		139.0		132.0			270.0		541.0
Germany	4	385.0	324.0									
Greece	2	39.0	31.2						72.0			72.0
Hungary	12	1,078.1	683.6		50.7	5.8	51.8	124.8	332.6	172.8	415.3	1,153.8
Indonesia	10	2,797.5	2,665.0		426.5			51.6	1,455.7	205.7	366.4	2,505.9
Italy	17	7,614.0	1,587.0					2.7	8.0	7.5		18.2
Kuwait	1	1,815.0	1,452.0		1,722.0		980.0			811.8		3,513.8
Libya	7	1,851.0	1,227.0					37.8	5,577.0		551.0	6,165.8
Malaysia	2	282.0	105.0	161.4	23.2	136.3	28.2			154.1		503.2
Mexico	11	4,649.0	3,370.4	12,704.9							9.5	12,714.4
Netherlands	1	350.0	35.0								1.8	1.8
New Zealand	4	1,152.0	533.0		39.1		1.1	97.0		9.0	733.7	879.9
Norway	2	950.0	507.0		682.0	108.0	256.0		200.0	193.0		1,439.0
Oman	8	626.0	309.4						202.0	43.0		245.0
Pakistan	6	430.0	187.7					48.8	6.1		9.1	64.0
Peru	2	70.0	37.0		3.4		1.0	5.6	28.9		4.0	42.9
Qatar	2	579.0	232.0		434.6		255.5			173.0		863.1
Saudi Arabia	5	4,300.0							1,176.0			1,176.0
Sharjah	2	990.0	925.0		221.0		251.0				1,341.0	1,813.0
Spain	3	428.0	177.0								73.0	73.0
Thailand	2	850.0	550.0					400.4	8.4	84.0		492.8
United Kingdom	8	3,732.0	1,537.0		332.0		291.0		155.4	1,748.5	53.8	3,853.3
Venezuela	14	2,913.0	2,557.0	213.3	197.4		113.4	231.3	3,274.6	171.9		4,201.9
Yemen	1	400.0	137.7							86.0		86.0
Total, outside U.S.	**682**	**80,466.9**	**46,278.8**	**19,410.9**	**8,338.2**	**1,109.6**	**3,875.0**	**5,273.9**	**16,609.6**	**10,698.6**	**13,043.2**	**78,359.0**
World Total	**1,424**	**147,213.8**	**88,124.0**	**25,846.9**	**16,942.9**	**2,363.9**	**7,653.6**	**6,904.2**	**54,112.2**	**15,184.8**	**17,522.3**	**146,530.8**

Company, plant, location	MMcfd Gas capacity	MMcfd Gas through-put	Process/ condition method	Production—1,000 gpd (Average based on the past 12 months) Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
ALABAMA											
Collet Ventures Inc.—Copeland Washington Co.	12.0	6.0	[13]2-[7]5-7					6.4		16.6	
Exxon Co. USA—Big Escambia Creek, Escambia Co., 4-1n-7e	40.0	20.0	6-7		53.4		43.4			23.1	
FMP Operating Co.—Womack Hill, Choctaw Co., 9-10n-2w	4.0	2.4	3		6.6		7.2			4.6	
Mobil Oil Exploration & Producing Southeast Inc.—Mary Ann, Mobile Co., 34-7s-2w	80.0	45.0	[13]1								
Phillips Petroleum Co.—Chatom, Washington Co., ne4-29-6n-4w	27.0	27.2	3		16.2		16.6			10.9	
Texaco Inc.—*Hatter's Pond, Mobile Co., 10-2s-1w	35.0	43.0	3		52.0		42.1			21.7	
Unocal—*Chunchula, Mobile Co., 22-1s-2w	57.0	55.2	3		57.3		44.2			27.4	
Total	**255.0**	**198.8**		....	**185.5**	....	**153.5**	**6.4**	....	**104.3**	....
ALASKA											
Arco Alaska Inc.—*Prudhoe Bay	3,300.0	3,300.0	3						2,140.0		
*Swanson River LTS, Kenai Borough, 4-7n-9w	30.0	25.0	3		3.5						[11]16.6
Unocal—Granite Point, Kenai Peninsula, 28-11n-12w	3.5	1.2	3						<0.1		
Total	**3,333.5**	**3,326.2**		....	**3.5**	....	....	....	**2,140.1**	....	**16.6**
ARKANSAS											
Amoco Production Co.—*Chalybeat Springs, Columbia Co., 34-19s-19w	28.0	27.0	7						33.6		
Associated Natural Gas Inc.—Walker Creek, Columbia Co., 24-19s-23w	30.0	26.5	2						19.6		
Natural Gas Pipeline Co. of America—DP 370, White County, 29-7n-7w	850.0	505.0	3						21.2		

Gas Processing Survey

To arrive at more accurate totals, natural-gas throughput and liquids production are estimated at 80% capacity in those cases where only capacities are available. This explains apparent discrepancies in the addition of some columns.

The letters NR mean no response.

*Indicates cycling operations.

The symbol < denotes less than 100 gal/day.

The process/conditioning methods in the third column are identified by the following numbers:

1—absorption
2—refrigerated absorption
3—refrigeration
4—compression
5—adsorption
6—cryogenic-Joule-Thomson
7—cryogenic-expander
8—stabilization

Agents used in processes 1, 2, and 5 are indicated by superscripts as follows:

[1] absorption oil
[2] activated alumina
[3] amine
[4] anhydrous ammonia
[5] Asorball
[6] coal
[7] DEA
[8] desiccant
[9] DGA
[10] diesel-No. 1
[11] ep naphtha
[12] freon
[13] glycol
[14] hot potassium carbonate
[15] iron sponge
[16] Jet A
[17] kerosine
[18] kero-propane
[19] lean oil
[20] MDEA,
[21] Mea,
[22] mineral seal oil
[23] mole sieve
[24] naphtha
[25] natural gasoline
[26] propane
[27] Purisol
[28] Q-Sol
[29] Selexol
[30] Sepasolv
[31] silica gel
[32] Sorbead
[33] Sulfinol
[34] Sulphalene
[35] TEG
[36] Varsol
[37] mw100
[38] mw110
[39] mw115
[40] mw120
[41] mw125
[42] mw127
[43] mw130
[44] mw131
[45] mw133
[46] mw140
[47] mw145
[48] mw150
[49] mw160
[50] mw175

Products listed in the last column are identified by numbers:

1—isopentane
2—upgraded motor fuel
3—diesel
4—kerosine
5—ethane-propane mix
6—solvent naphtha
7—jet fuel
8—normal pentane
9—residuum, bottoms
10—distillate, fuel oil
11—condensate
12—gas oil.

Figures in parentheseis do not represent primary production, and are not added in state totals.

Since this compilation includes cycling plants reprocessing pipeline gas, totals shown here for gas throughput do not relate directly to government data on total gas processed, or sold. Similarly, liquids production figures are based on yearly average and do not necessarily reconcile with government data.

Company, plant, location	MMcfd Gas capacity	MMcfd Gas through-put	Process/ condition method	Production—1,000 gpd (Average based on the past 12 months) Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Oxy NGL Inc.—*Walker Creek, Columbia Co., 23-19s-23w	25.0	22.1	2		3.0		4.0			6.0	[11]3.0
Total	933.0	580.6		....	3.0	....	4.0	....	74.4	6.0	3.0

CALIFORNIA

Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
ARCO Oil & Gas Co.—No. Coles Levee No. 8, Kern Co., 32-305-25e MDB&M	20.0	10.6	[26]2		38.9	8.0	16.4			16.0	
Ojai Timber No. 18, Ventura Co., Rancho Ojai 36	3.0	6.9	3								
Chevron USA Inc.—Carpinteria, Santa Barbara Co., 33-4n-25w	23.0	6.0	3		0.7		2.8			1.5	
Huntington Beach, Orange Co., 3-6s-11w	3.5	1.8	3						2.0		
Inglewood LTS, Los Angeles Co., 8-25-4w	15.0	6.4	3						15.0		
Kettleman 3-P, Kings Co., 3-22s-17e	10.0	4.5	3						6.9		
McKittrick Seventeen-Z, Kern Co., 17-30s-22e	80.0	49.1	[1,26]2		44.3				48.6		
Murphy-Coyote, Orange Co., 18-3s-10w	5.0	1.4	3						2.4		
Race Track 32-Z, Kern Co., 32-30s-29e	7.0	0.3	3						0.2		
Taft 1-C LTS, Kern Co., 1-32s-23e	16.0	10.4	3		2.1		4.3			12.6	
Torrance, Los Angeles Co., 24-4s-14w	3.0	0.7	3						1.0		
Department of Energy—35R, Kern Co., 30s-23e-35-R	94.0	78.7	[1]1		51.3		52.8			46.2	
LTS-1, Kern Co., 30s-23e-35R	100.0	119.0	3		81.5		75.3			68.4	
LTS-2, Kern Co., 30s-23e-35R	100.0	124.1	3		89.3		68.1			67.9	
Lomita Gasoline Co.—Harbor, Los Angeles Co.	40.0	12.0	4						4.5		
Signal Hill, Los Angeles Co.	14.0	5.0	3		2.0				16.5		
Marathon Oil Co.—South Coles Levee, Kern Co., 3-31s-25e	80.0	25.0	1-[1]5		9.0	1.3	2.6			6.8	
Mobil Oil Corp.—Rincon, Ventura Co., 7-3n-24w SBB&M	20.0	8.0	3								[11]11.0
Shell Western E&P Inc.—Clark Ave., Santa Barabara Co., 9-9n-33w	3.6	1.0	3						1.0		
Huntington Beach, Orange Co., 3-6s-11w	15.0	3.4	3					6.6			
Kernridge, Kern Co., 32-28s-1e	60.0	58.2	2		33.2	23.5		58.2			
Molino, Santa Barbara Co., 31-5n-31w	20.0	1.1	2		0.4			1.3			
Texaco Inc.—Buena Vista Hills, Kern Co., 8-32s-24e MDB&M	20.0	6.8	[19]1		6.7				10.0		
Cymric, Kern Co., 26-29s-22e MDB&M	2.0	1.3	3						2.1		
Lost Hills, Kern Co., 9-27s-21e	60.0	33.1	3		14.0				33.5		
Montebello, Los Angeles Co.	2.0	0.4	3						0.1		
Shiells Canyon, Ventura Co., 4-4n-19w-SBBM	18.0	6.7	[19]2		23.3	7.9	15.3			12.0	
Ventura Co., 27-3n-23w SBB&M	20.0	14.0	[19]2		23.3	7.9	15.3			12.0	
Unocal—Battles, Santa Barbara Co., 24-10n-34w SBB&M	35.0	12.4	[48]1		18.3		12.8			12.2	
Bell, Los Angeles Co., 6-3s-11w, SBB&M	0.6	0.5	4								[11]0.5
*Coalinga Nose, Fresno Co., 7-20s-16e, SBB&M	70.0	63.6	7		34.2		7.7			22.7	
Dominguez, Los Angeles Co., 33-3s-9w SBB&M	3.0	1.9	2						3.6		
Santa Clara Valley, Ventura Co., 31-4n-18w, SBB&M	17.0	9.5	7					13.7		6.2	
Stearns, Orange Co., 7-3s-9w SBB&M	20.0	6.4	[48]1		7.3				22.9		
Total	999.7	690.2		....	479.8	48.6	273.4	79.8	170.3	284.5	11.5

COLORADO

Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Amoco Production Co.—Spindle, Weld Co., 34-2n-67w	37.0	NR	7						73.7		[11]7.4
Wattenberg, Adams Co., 32-3s-65w	150.0	59.0	7						98.2		
Associated Natural Gas Inc.—Eaton, Weld Co., se 34-7n-66w	15.0	10.9	3						31.2		
Greeley, Weld Co., sw 25-5n-66w	25.0	21.4	3-6						58.7		
Kersey, Weld Co., se 35-4n-66w	35.0	28.0	3						48.6		
Lucerne, Weld Co., nw¼ se½ 28-6n-65w	15.0	12.6	3-6						38.1		
Brighton Gas Processors—Brighton, Weld Co., se4 se4 28-1n-67w 6th PM	2.5	1.2	3						2.7		[11]<0.1
Cabin Creek Gas—Cabin Creek, Adams Co., sw4 nw4 31-3s-59w 6th PM	1.5	0.1	3						1.6		
Celsius Energy Co.—Dove Creek, Dolores Co., 5-40n-18w	10.0	5.7	3						15.5		
Chevron USA Inc.—*Rangely CO_2, Rio Blanco, 32-2n-102w	60.0	60.0	4								
Conoco Inc.—Dragon Trail, 6PM, 2-102w-3s	18.0	14.0	[1]2		12.0			15.0			
Coors Energy Co.—Wattenberg, Weld Co., 25-1n-68w	8.5	6.0	3						6.0		
Enron Gas Processing Co.—Greeley, Weld Co., sw 25-5n-6w	6.0	1.9	3		1.6				3.4		
Four H Partnership—Piceance Creek, Rio Blanco Co., 15-25-96w (25 miles se of Rangely)	40.0	15.0	[1]2		6.0				6.0		
Greeley Gas Co.—Clyde, Prowers Co., 19-23s-45w	5.0	5.0	3						4.0		
Koch Hydrocarbon Co.—Third Creek, Adams Co., 18-25-65w	25.0	15.8	2		18.7				58.4		[11]2.6
Loveland Gas Processing Co. Ltd.—*Loveland, Larimer Co., se-se-se30-5n-68w	6.0	2.0	3		3.2					[1]4.0	
McMoRan Oil & Gas Co.—Yenter, Logan Co., nw¼ 2-8n-54w	8.0	3.1	[1]2		6.7			5.8			
Northwest Pipeline Corp.—Foundation Creek, Rio Blanco Co., 26-45n-102w	20.0	4.5	3						2.9		

Company, plant, location	MMcfd Gas capacity	Gas through-put	Process/ condition method	Production—1,000 gpd (Average based on the past 12 months) Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Ignacio, La Plata Co., sw¼ 36-34n-114w	300.0	176.0	7		84.0		42.0			27.0	
North Douglas Creek, Rio Blanco Co., 19-1s-101w	20.0	7.6	3						6.7		
Oryx Energy Co.—Denver Central, Arapahoe Co., 5-5s-62w	12.0	4.8	[19]2		14.9				12.8		
Ralston Processing Associates Inc.—*McClave, Kiowa Co., 32-20s-48w	7.2	3.3	[1]2		4.7			3.3			
Rocky Mountain Natural Gas Co. Inc.—Collbran, Mesa Co., 35-9s-95w	5.0	4.6	3						0.5		
Piceance, Rio Blanco Co., 22-1n-97w	15.0	1.2	3						1.1		
Slick Rock, San Miguel Co., 30-44n-18w	15.0	5.0	3						1.4		
South Canyon, Garfield Co., 3-8s-104w	15.0	7.0	3						1.5		
Roggen Gas Processing Co.—Roggen, Main, Weld Co., se¼ sw¼ 24-2n-63w	31.0	23.5	7		41.0				42.7		
Valley, Morgan Co., 15-3n-59w	1.5	0.6	3						1.9		
Tejas Gas Corp.—Chalice, Arapahoe Co., 10-4s-64w	3.0	1.4	3					3.5			
Running Creek, Elbert Co., 21-6s-64w	5.0	3.4	3-6					17.0			
Texaco Inc.—Wilson Creek, Rio Blanco Co., 27-3n-94w	2.0	1.6	3						3.8		
Texas Oil & Gas Corp.—Baca County, 11-33s-42w Grid 9	5.0	2.2	3						9.3		†0.1
Union Pacific Resources—Bledsoe Ranch, Cheyenne Co., 1-13s-51w	1.8	1.2	3						2.1		
Mt. Pearl, Cheyenne Co., 35-13s-48w	10.0	4.0	3						10.5		
Vessels Gas Processing Ltd.—Ft. Lupton, Weld Co., se¼ 28-1n-67w	45.0	30.0	3						40.0		
Vessels Oil & Gas Co.—Ft. Lupton Fractionator, Weld Co., se½ 28-1n-67w			§	(35.0)	(63.0)		(58.0)			(34.0)	
Western Gas Processors Ltd.—Lanson Farms, Weld Co., nw4-ne4 35-2n-68w	1.5	0.1	3						1.5		
Total	**982.5**	**573.3**		.....	**192.8**	.....	**42.0**	**44.6**	**584.8**	**31.0**	**10.2**

†Butane-gasoline mix. §Fractionation. (Figures in parenthesis do not represent primary production, and are not added in state totals).

FLORIDA

Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Enron Gas Processing Co.—Brooker, Bradford Co.	700.0	629.0	[19]2		47.5	13.3	16.2			46.7	
Exxon Co. USA—Jay, Santa Rosa Co., 9 n43-5n-29w	90.0	13.0	6-7	79.4	73.6		45.2			16.4	
Total	**790.0**	**642.0**		**79.4**	**121.1**	**13.3**	**61.4**	.....	.....	**63.1**	.....

KANSAS

Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Amoco Production Co.—Ulysses, Grant Co., 5-29s-38w	400.0	152.0	[19-49]2		44.7	17.1	49.4			38.9	
Anadarko Petroleum Corp.—Cimarron, Seward Co., 23-33s-32w	15.0	13.0	[1]2		8.2				9.0		
Woods, Seward, 22-33s-34w	8.0	7.0	[1]2		2.4				5.6		
Colorado Interstate Gas Co.—Lakin, Kearney Co., n2 ne4 29-24s-36w	250.0	83.0	1							10.3	
Morton Co.	25.0	25.3	3							39.9	
Enron Gas Processing Co.—Bushton ethane, Ellsworth Co., 31-17s-9w	500.0	245.0	7	224.4							
Bushton hydrocarbon, Ellsworth Co., 31-17s-9w	950.0	886.0	[19]2		704.0	100.7	209.2			145.8	
Enron Helium Co.—Bushton, Ellsworth Co., 31-17s-19w	500.0	450.0	6								‡1.6
KN Energy Inc.—Scott City Helium, Scott Co., 17-18s-33w	75.0	62.0	3	2.2	33.8		18.5			4.3	
Scott City NGL, Scott Co., 17-18s-33w	150.0	99.8	1				2.0			12.8	
Sunflower, Scott Co., 17-18s-33w	168.0	66.3	3-6						85.0		
Mesa Limited Partnership—Ulysses, Grant Co., 10-30s-37w	242.0	65.7	[19]2						79.8		
Mobil Oil Corp.—Hickok, Grant Co., 31-28s-35w	210.0	102.0	4								
National Helium Corp.—Seward Co., 23-33s-32w	1,000.0	630.0	3		17.7		158.8			100.8	
Northern Natural Gas Co.—Holcomb, Finney Co., 3-24s-34w	200.0	181.4	3						42.1		
Oxy NGL Inc.—Cheney, Kingman Co., nw4 22-28s-5w	100.0	61.5	7						86.0		
Hutchinson, Reno Co., sw4 22-23s-6w			†	(187.0)	(683.0)	(112.0)	(270.0)			(251.0)	
Jayhawk, Grant Co., 2-29s-35w	550.0	350.0	2-6						394.0		
Midway, Kingman Co., 33-27s-5w	30.0	22.9	2						31.5		
Spivey, Harper Co., 5-31s-8w	66.0	18.6	1		20.0		11.0			11.0	
Wichita, Sedgwick Co., 17-28s-1e	89.0	53.3	7								
Wilburton, Morton Co., 33-34s-41w	5.0	1.8	3						6.9		
Peoples Natural Gas Co.—Burrton, Harvey Co., 21-23s-34w	4.5	3.0	3					0.9			
Texaco Producing Inc.—Minneola, Ford Co., 13-29s-25w	25.0	7.5	[19]2		10.0				9.4		
Total	**5,562.5**	**3,587.1**		**226.6**	**840.8**	**117.8**	**448.9**	**0.9**	**749.3**	**363.8**	**1.6**

†Fractionation. (Figures in parenthesis do not represent primary production, and are not added in state totals). ‡Helium—MMcfd.

KENTUCKY

Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Kentucky Hydrocarbon—Dwale Cryogenic, Floyd Co.	20.0	13.7	3-7						24.3		
Maytown, Floyd Co.	51.0	53.8	3-6-7						145.0		
Total	**71.0**	**67.5**		.....	.....	.....	.....	.....	**169.3**	.....	.....

Company, plant, location	MMcfd			Production—1,000 gpd (Average based on the past 12 months)							
	Gas capacity	Gas through-put	Process condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
LOUISIANA											
Amoco Production Co.—West Hackberry, Cameron Par., 15-12s-10w	2.0	1.0	7						0.4		
ARCO Oil & Gas Co.—Bayou Sale, St. Mary Par., [illegible]	97.0	51.2	[12]2		6.7		5.8			6.5	
Arkla Inc.—Elm Grove, Bossier Par.	3.0	1.3	3						0.6		
[illegible], Caddo Par., 35-16n-12w	3.0	1.3	3						0.3		
Associated Natural Gas Inc.—Minden, Webster Par.	55.0	33.4	2						41.8		
Bruin Petroleum Inc.—Port Hudson, East Baton Rouge Par.	40.0	30.0	3						22.0		
Claiborne Gasoline Co.—Lisbon, Claiborne Par., 20-21n-4w	75.0	46.1	[12]2		37.0	12.7	16.3			29.7	
Coastal Oil & Gas Corp.—Pelican, St. Mary Par., 51&52-15s-11e	250.0	225.0	7						169.3		
Conoco Inc.—Acadia Par., 31-9s-1e	65.0	34.2	7	27.5	16.8		12.2				2.3 14.2 1.8 2.3
Gillis, Calcasieu Par., [illegible] 14-9s-8w	180.0	172.5	7	153.4	75.9	25.9	19.7			33.5	
Grand Chenier, Cameron Par., 2-39-40, 15s-4w	950.0	359.8	[12]7	147.5	85.1	33.1	22.2			52.4	
CSX NGL Corp.—Bastian Bay, Plaquemines Par., 42-20s-28e	175.0	59.0	7						65.0		
Cow Island, Vermilion Par., 29-13s-2e	950.0	186.0	2						145.0		
Eunice, Acadia Par., [illegible] 12-7s-2w	1,350.0	1,141.0	[12]7	316.0	233.0	85.0	75.0			148.0	
Lake Enfermer, LaFourche Par., 9-20s-23e	40.0	9.0	7						13.0		
Riverside fractionation, Ascension Par., 8-10s-2e 46-9s-2e			1	(147.0)	(111.0)	(42.0)	(35.0)			(65.0)	
[illegible]—White Castle, Iberville Par., 15-10s-13e	7.5		7								
Endevco Natural Gas Co.—Dubach											
Lincoln Par.	90.0	25.0	3		45.0	12.7	15.5			37.8	
Calhoun	60.0	30.0	[12]2					30.0			
Exxon Co. USA—Bluewater, Acadia Par., 16-10s-1e	950.0	657.0	6-7	274.8	117.3	37.0	33.9			84.5	
Garden City, St. Mary's Par., 45-46, 15s-11e	600.0	197.0	2	86.1	52.8	23.1	11.2			42.6	
Grand Isle, Jefferson Par., 32-21s-25e	100.0	90.0	7						170.0		1.1
Kerr-McGee Corp.—Bayou Croix Chene, St. Martinville Par., 34-10s-9e	12.5	NR	2						15.0		
LIG Liquids Corp.											
Aymond, St. Mary Par., 13-14s-9e	40.0	8.9	7						9.3		
Gibson, Terrebonne Par., 77-16s-15e	90.0	64.6	7						80.6		
Plaquemine, Iberville Par., 46-10s-12e	225.0	118.4	7		49.5	15.4	16.9			37.5	104.5
St. Landry, Evangeline Par., 35-2s-2e	70.0	66.0	2		25.2		15.6			13.8	
Marathon Oil Co.—Burns Point, St. Mary Par., 10-17s-9e	200.0	179.0	7						150.4		
Cotton Valley, Webster Par., 26-21n-10w	65.0	40.2	7	48.1	23.8	9.7	8.2			16.0	[11]22.2
Phoenix Lake, Calcasieu Par., R13w T11s	1.0	0.6	6					0.2			
Theall Lee Unit, Vermilion Par., 36-2E-T12S	4.0	0.9	6						0.1		
Oryx Energy Co.—Delhi, Richland Par., 15-17n-9e	22.0	15.3	6		3.7		3.3			12.0	
Fordoche, Pointe Coupee Par., 41-6s-8e	35.0	43.9	7						24.1		
Gillis-English Bayou, Calcasieu Par., 26-8s-5w	20.0	7.7	[12]2						12.5		
Maurice, Lafayette Par., 31-10s-4e	32.0	24.2	[12]2						73.3		
South Sarepta, Bossier Par., 21-22n-11w	25.0	10.2	[12]2						18.5		
Oxy NGL Inc.—Cameron, Cameron Par., Tract 22 & 23, 15s-13w	310.0	270.0	7						145.0		
Gulf Coast fractionation—Chambers Co., Henry Griffin League A-12			1	(1,135.0)	(861.0)	(187.0)	(383.0)			(386.0)	
Lake Charles Fractionation, Calcasieu Par., 19-10s-9w			1	(400.0)	(318.0)	(100.0)	(85.0)			(153.0)	
Lowry, Cameron Par., 16-12s-4w	300.0	130.0	7						179.0		
Sea Robin II, Vermilion Par., 21-13s-4e	200.0	105.0	7						93.0		
Petro-Hunt Corp.—Kinder, Allen Par., 23-5s-5w	25.0	6.0	[12]2		4.2		2.7			1.4	
Phillips, Jack L.—Oretta, Beauregard, Par.	3.0	0.5	3						0.5		
Placid Oil Co.—Patterson II, St. Mary Par., 48-15s-11e	400.0	140.0	7						111.0		
Resources Extraction & Processing Co.—Bayou Vista I, St. Mary Par., 11-15S-11e	200.0	200.0	7						200.0		
Shell Western E&P Inc.—Barracuda, Cameron Par., 15s-13w	195.0	147.3	7						168.0		
Calumet, St. Mary Par., 11, 12, 51, 52, 15s-11-3	1,200.0	824.8	2						380.3		
Crawfish, St. Charles Par., 36-13s-8e	120.0	34.6	7						29.3		
Elba, St. Landry Par., 4s-7e	1.5	1.3	3						2.6		
Norco fractionator, St. Charles Par., 6-12s-8e			1	(451.0)	(291.0)	(96.5)	(110.9)			(200.8)	
North Terrebonne, Terrebonne Par., 19,20,29,33-17s-15e	1,250.0	902.3	2						844.5		
Stingray, Cameron Par., 33&34-15s-13w	295.0	232.1	2						118.6		
Tebone fractionator, Ascension Par., 45&46-9s-2e			1	(222.4)	(274.6)	(84.9)	(85.2)		(177.5)		
Toca, St. Bernard Par., 54-14s-14e	830.0	490.4	2-7						504.5		
Yscloskey, St. Bernard Par., 39-13s-15e	1,850.0	1,291.8	2						860.1		
Sid Richardson Carbon & Gasoline Co.—											
Hico-Knowles, Lincoln Par., 9 acres sw¼ of se¼10 & nw¼ of ne¼ 15-20n-3w	15.0	3.4	7						6.0		[11]2.0
Tejas Gas Corp., Lake LaRose, St. Martin Parish	16.0	4.3	7					5.4			
Tenneco Natural Gas Liquids Corp.—											
R.M. Stephens, Claiborne Par., 6&7-13s-12e	35.0	15.2	2		9.9		11.0			8.4	

Company, plant, location	MMcfd			Production—1,000 gpd (Average based on the past 12 months)							
	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Sabine Pass, Cameron Par.	200.0	160.9	7						129.6		
Texaco Inc.—Alligator Bayou, St. Martin Par. sw14 34-10s-9e	27.0	9.4	6-7						29.6		[11]0.1
Floodway, St. Mary Par., 16-16s-12e	600.0	204.4	6-7						151.8		
Henry, Vermilion Par., 21-13s-4e	803.0	358.6	[37]2-6-7	156.5	101.4	32.1	27.4			65.1	
Paradis, St. Charles Par., 39-14s-20e	660.0	170.5	[43]2 6-7	75.7	86.4	21.2	21.0			36.3	
Sea Robin, Vermilion Par., 21-13s-4e	900.0	323.3	6-7						315.7		
Venice, Plaquemines Par., 25&26 21s-30e	65.0	21.7	[46]2						14.8		
Texas Eastern Transmission Corp.—											
Iowa, Jefferson Davis Par., 18-9s-6w	500.0	370.0	6-7						206.0		
Pointe au Chien, Terrebonne Par., 18-19s-20e	125.0	71.0	7						49.0		
Texas Oil & Gas Corp.—Ruston, Lincoln Par., ne4 of nw4 12-19n-4n	30.0	10.8	3						9.3		[11]0.1
Union Texas Petroleum—Cox Bay, Plaquemine Par., 5-18s-16e	20.0	13.4	[19]1		3.0	1.0	1.1			2.8	
Pointe-a-la-Hache, Plaquemine Par., 78-13s-14e	20.0	9.5	[19]2		1.1	0.5	0.4			1.5	
Sligo, Bossier Par., 29-18n-11w	70.0	25.7	[19]2		10.1	2.3	3.2			6.5	
Toca, St. Bernard Par., 56-14s-14e	160.0	97.3	[19]2		40.6	12.2	13.7			30.1	
Warren Petroleum Co.—Johnson Bayou, Cameron Par., 10 acres 32&33 155-155-13w	NR	4.5	7						4.2		
Krotz Springs, St. Landry Par., 22-6s-7e	NR	5.2	[19]2		7.8		3.6			8.0	[11]11.9
Mermentau, Acadia Par., n½-n½ 70-10s-2w	NR	12.4	1						17.3		
Venice, Plaquemines Par., 25-21s-30e	NR	403.7	[19]2		89.5	31.7	36.1		54.4		[5]161.1
Vermilion Par., s2 sw4 nw4 28-13s-2e	NR	63.5	7						83.8		
Total	**18,921.1**	**11,069.9**		**1,285.6**	**1,116.8**	**346.6**	**461.2**	**35.6**	**5,719.8**	**674.4**	**322.6**

†Fractionation. (Figures in parenthesis do not represent primary production, and are not added in state totals).

MICHIGAN

Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Amoco Production Co.—Kalkaska Co., 31-27n-7w	180.0	90.0	7		51.6					73.6	[11]23.4
ANR Pipeline Co.—*Austin dehydration, Mecosta Co., 4-14n-9w	500.0	146.0	[12]5								[11]1.7
*Capac dehyd., St. Clair, 16-7n-13e	300.0	89.0	[13]1								
*C. Charlton-1 sep., Otsego Co., 1-30n-1w	220.0	131.0	3								[11]10.6
*Coldwater dehyd., Isabella Co., 29-16n-6w	40.0	15.0	[13]1								
*Croton dehyd., Newaygo Co., 29-12n-11w	50.0	13.0	[13]1								
*Goodwell dehyd., Newaygo Co., 4-14n-11w	385.0	153.0	[12]5								[11]0.9
*Lincoln dehyd., St. Clair Co., 20-18n-5w	300.0	106.0	[12]5								[11]0.8
*Loreed, Osceola Co., 30-18n-10w	32.0	29.5	3						1.0		
*Loreed dehyd., Osceola Co., 30-18n-10w	1,000.0	158.0	[13]1								
*Muttonville dehyd., Macomb Co., 13-4n-14e	450.0	108.0	[13]1								
*North Hamilton dehyd., Clare Co., 6-19n-3w	40.0		[13]1								
*Norwich dehyd., Newaygo Co., 4-14n-11w	50.0	17.0	[13]1								
*Orient dehyd., Osceola Co., 13-17n-7w	50.0	17.0	[13]1								
*Reed City dehyd., Osceola Co., 30-18n-10w	300.0	91.0	[13]1								
*South Chester-15 sep., Otsego Co., 15-29n-2w	270.0	130.0	3								[11]10.0
*Winfield dehyd., Montcalm Co., 7-12n-9w	100.0	31.0	[13]1								
Conoco Inc.—Aurelius, Ingham Co., 36-2n-2w	22.0	5.8	[43]2		8.4			9.1			
Marathon Oil Co.—Scipio, Hillside Co., 10-5s-3w	38.0	4.2	2, 5		16.4					14.5	
Stoney Point, Hillsdale Co., 5-5s-2w	4.5	4.5	3						7.2		
West Branch, Ogemaw Co., 27-22n-2e	20.0	12.5	7						25.0		
Michigan Consolidated Gas Co.—											
Romeo, Macomb Co., 14-4n-12e	15.0	14.0	3						8.1		[11]3.5
Oryx Energy Co.—*Columbus III, Saint Clair Co., 3-5n-15e	7.4	8.3	3						4.7		
Mentor, Oscoda Co., 29-25n-3e	9.7	7.9							3.5		
Mt. Pleasant, Isabella Co., 2-14n-3w	3.0	0.9	3						1.2		
Norwich, Missaukee Co., 12-24n-5w	10.0	3.0	6						10.8		
Williams, Midland Co., 35-15n-2e	1.5	0.2	3						0.7		
Shell Western E&P Inc.—											
Foster 28, Ogemaw Co., 28-24n-2e	15.0	12.4	6					24.5			
Kalkaska Co., 32-27n-7w	350.0	154.3	2						566.2		
Total	**4,763.1**	**1,552.5**		....	**76.4**	....	....	**33.6**	**628.4**	**88.1**	**50.9**

MISSISSIPPI

Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Kerr-McGee Corp.—McComb, Amite Co., 21-4n-6e	2.0	NR	3						1.2		
Koch Hydrocarbon Co.—Harmony, Clarke Co., 26-2n-14e	30.0	5.1	3		5.8		4.4			6.3	[11]1.8
Shell Western E&P Inc.—											
Goodwater, Clarke Co., 5-10n-8w	15.0	4.8	3		1.4		1.8			1.4	
Tallahala Creek, Smith Co., 5-1n-9e	4.0	4.0	3		1.1		1.5			1.7	
Thomasville, Rankin Co., 27-4n-3e	100.0	73.3	[11]1								
Southern Natural Gas Co.—*Muldon, Monroe Co., 27-15s-6e	750.0	302.0	[5]5						10.6		
Total	**901.0**	**390.8**		....	**8.3**	....	**7.7**	....	**11.8**	**9.4**	**1.8**

MONTANA

Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Coastal Oil & Gas Corp.—Stateline, Richland Co., 7-22n-59e	12.0	2.2	3		5.1			5.4			[11]0.8
Shell Western E&P Inc.—											
Cabin Creek, Fallon Co., 18-10n-58e	1.9	1.6	3		2.2		3.2			2.1	
Little Beaver, Fallon Co., 8-4n-62e	0.4	0.3	3		0.9		0.6			0.4	

Company, plant, location	MMcfd Gas capacity	MMcfd Gas through-put	Process/ condition method	Production—1,000 gpd (Average based on the past 12 months) Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
South Pine, Wibaux Co., 10-11n-57e	1.2	0.7	3	....	1.8	....	1.7	....	....	1.4	....
True Oil Co.—Bob Rhodes, Richland Co., ne 4-25n-58e	4.0	0.5	3	....	....	....	....	3.3	....	....	....
Western Gas Processors Ltd.—Baker, Fallon Co., sw4 sw4 6-7n-60e	2.5	1.8	3	....	12.6	6.8	....	3.5	15.1	6.6	
Fairview, Richland Co., w2 sw4 24-25n-58e	5.0	3.6	3	....	7.0	....	....	8.8	....	....	[11]0.2
Total	**27.0**	**10.7**		....	**29.8**	**6.8**	**5.5**	**21.0**	**15.1**	**10.5**	**1.0**

NEBRASKA

Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Oxy NGL Inc.—Kimball, Kimball Co., 10-12n-55w	**1.5**	**0.8**	**3**	....	....	....	....	....	**0.4**		

NEW MEXICO

Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Amoco Production Co.—*Empire Abo, Eddy Co., 3-18s-27e	42.0	40.0	7		30.5		9.1		76.7	3.2	
Cabot Transmission Corp.—Hobbs, Lea Co. Sec. 28, 18s-36e	60.5	....	7								
Conoco Inc.—Maljamar, Lea Co., sw se 21-17s-32e	25.0	20.5	7						139.4		
San Juan Co., 14-29n-11w	500.0	500.0	7						1,680.0		
Davis, J.L.—Denton, Lea Co., 2-7-155-37e	15.0	6.0	7						42.0		
El Paso Natural Gas Co.—Blanco, San Juan Co., n2-n2 14-29n-11w	558.0	474.5	4								
Chaco, San Juan Co., sw4 16-26n-12w	594.0	252.9	[18]2						318.4		
Jal No. 3, Lea Co., nw4-sw4 33-24s-37e	225.0	75.9	[19]2						57.3		
San Juan River, San Juan Co., Sec. 1, 29n-r15w	50.0	16.3	[7-20]1								
Wingate, McKinley Co., 16&17-15n-17w	....	....	†	....	(320.7)	(75.5)	(144.7)			(173.8)	
Marathon Oil Co.—Indian Basin, Eddy Co., 23-21s-23e	180.0	96.3	7						147.1		[11]25.5
Mesa Limited Partnership—South Blanco Creek, 6-7w-23n	6.0	2.5	3						12.7		
Minerals Inc.—Hobbs, Lea Co., sw¼-sw¼-ne¼ 36-18s-36e	45.0	NR	7						58.0		
Kermac, Eddy Co., 4-21s-31e	6.0	NR	6						0.8		
Northern Natural Gas Co.—Hobbs, Lea Co., 6-19s-37e	220.0	85.9	[19]2						131.2		
Oxy NGL Inc.—Bluitt, Roosevelt Co., 15-8s-36e	27.5	15.8	7						79.0		
Phillips 66 Natural Gas Co.—Artesia, Eddy Co., s2 se4 7-18s-28e	50.0	46.3	7						199.7		
Eunice, Lea Co., ne4 3-22s-37e	98.0	85.4	7						501.4		
Lee, Lea Co., sw4 se4 30 nw4-ne4-31-17s-35e	40.0	40.6	7						351.0		
Sunterra Gas Processing Co.—											
Kutz No. 1, San Juan Co., nw4 13-28n-11w	140.0	42.4	2						89.6		
Kutz No. 2, San Juan Co., nw4 13-28n-11w	85.0	70.0	7						206.3		
Lybrook, Rio Arriba Co., nw¼ 14-23n-7w	85.0	40.5	7						74.8		
Texaco Inc.—Buckeye, Lea Co., se¼ of se¼ 36-17s&18s-34e, 1 mi se of Buckeye	25.0	5.5	6						53.8		
Texaco Producing Inc.—Eunice No. 1, Lea Co., 27-22s-37e	105.0	75.2	7	157.4	110.0	12.2	36.1			47.1	[11]2.7
Warren Petroleum Co.—											
Eunice, Lea Co., ne4 3-22s-37e	NR	48.8	7						236.0		
Monument, Lea Co., sw4 36-19s-36e	NR	49.9	7		17.3				203.0		
Saunders, Lea Co., 34-14s-33e	NR	22.6	6						176.0		
Vada, Lea Co., sw2-sw4-nw4 23-10s-33e	NR	10.2	6						71.0		
Total	**3,346.4**	**2,164.8**		**157.4**	**157.8**	**12.2**	**45.2**	....	**4,905.2**	**50.3**	**28.2**

†Fractionation. (Figures in parenthesis do not represent primary production, and are not added in state totals).

NORTH DAKOTA

Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Cenex—Coyote Creek, Bowman Co., 131n-104w-27	3.0	0.7	[19]2		1.1		2.9				
Koch Hydrocarbon Co.—Grasslands, McKenzie Co., 36-148n-105w	70.0	56.4	7		102.3		63.3			68.4	
Oxy NGL Inc.—Lignite, Burke Co. nw4 7162n-91w	11.0	6.1	2		12.0		6.0			6.0	
True Oil Co.—Red Wing Creek, McKenzie Co., ne27-148n-101w	10.0	2.5	3					17.8			
Warren Petroleum Co.—Little Knife, Dunn Co., 16-141n-98w	NR	22.1	7		49.4				50.7		
Western Gas Processors Ltd.—Alexander, McKenzie Co., e½ sw¼ sw¼ 18-152n-101w	3.0	2.5	3								[11]1.8
Teddy Roosevelt, Billings Co., nw4-ne4 16-142n-99w	65.0	27.8	2-7		23.1		20.7			20.7	[11]11.1
Temple, Williams Co., Lot 4, 30-159n-95w	4.0	2.0	3						5.9		[11]0.3
Total	**193.8**	**120.1**		....	**187.9**	....	**92.9**	**17.8**	**56.6**	**95.1**	**13.2**

OKLAHOMA

Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
American Central Gas Cos. Inc.—Stroud, Lincoln Co., se4, 6-14n-6e	12.0	9.0	3						13.5		
Amoco Production Co.—											
Hitchcock-Okeene, Blaine Co., 13-17n-11w	55.0	NR	7						65.4		[11]1.7
Mooreland, Woodward Co., 30-23n-18w	145.0	60.0	7						126.5		[11]4.0
Anadarko Petroleum Corp.—											
Beaver Co., se 25-6n-21ecm	8.0	5.8	7						6.7		
North Richland Center, Texas Co., 33-6n-12ecm	25.0	12.4	[1]2		13.7				12.2		

Company, plant, location	MMcfd Gas capacity	MMcfd Gas through-put	Process/ condition method	Production—1,000 gpd (Average based on the past 12 months) Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
ARCO Oil & Gas Co.—											
Covington, Garfield Co., w2-sw4 19-22n-3w	15.0	13.3	7	12.9	16.9	2.6	7.2			8.9	[11]0.2
Drumright, Creek Co., nw4 sw4 28-18n-7e	15.0	4.1	[19]1	0.2	10.9	1.8	5.4			9.1	[11]0.2
Tecumseh, Pottawatomi Co., sw1/4 36-9n-3e	5.0	8.2	3	4.2	12.0	1.7	5.9			6.5	[11]1.5
Beard Oil Co.—Choctaw, Oklahoma Co., 23-12n-1w	3.0	3.0	3					5.0			
BP Exploration—Crescent, Logan Co., nw 34-17n-4w	45.0	26.1	6					138.0			
*Elmore, Garvin Co., 17-1n-2w	30.0	24.2	7					72.6			
Cabot Transmission Corp.—Beaver Co., 25-5n-23ecm	20.0	13.2	7						32.6		
CNG Producing Co.—Southwest Davis, Murray Co., 15-15s-1e	2.0	0.7	4						2.8		
Coastal Oil & Gas Corp.—Custer Co., ne4 5-13n-17w	200.0	137.9	7						181.7		
Colorado Interstate Gas Co.—Keyes, Cimarron, e2 of se4 17-5n-7e	30.0	7.8	3							3.6	
Conoco Inc.—											
*Cashion, Kingfisher Co., ne ne 9-15n-5w	30.0	19.8	7	30.9	22.2	2.8	8.7			8.6	
*Clinton, Custer Co., sw 26-12n-16w	75.0	71.8	7	122.5	65.7	1.2	15.7			13.7	
*Hennessey, Kingfisher Co., nw nw 36-19n-7w	30.0	28.3	7	59.4	36.4	4.9	13.4			14.0	
*Mustang, Grady Co., 30-10n-5w	30.0	30.1	7	33.2	23.5	3.1	8.5			8.7	
Damson Gas Processing Corp.—											
Hooker, Texas Co., 8-4n-17e	70.0	35.6	7						106.8		
Deisenroth Gas Products Inc.—Okemah, Okfuskee Co., 23-11n-9e	1.0	9.5	[1]1						3.3		
El Paso Natural Gas Co.—											
*Beaver Co., se4-ne4 18-3n-26e	40.0	4.6	3						5.5		
Enogex Production Corp.—											
Calumet, Canadian Co., ne4 28-14n-9w	250.0	140.0	[19]2		31.0	5.2	8.5			10.6	
Choctaw, Oklahoma Co.	12.0	12.0	7	1.7	3.3	0.6	2.7			3.0	
Dibble, McClain Co., 35-7n-4w	2.0	1.5	3	1.0	1.9	0.3	0.9			1.0	
Edmond, Okla. Co., 32-14n-4w	15.0	13.0	7	12.8	14.0	2.0	5.7			5.0	
Henryetta, Okmulgee Co., 33-13n-12e	10.0	7.0	6	2.0	3.5	0.7	1.4			1.5	
Slaughterville, Cleveland Co.	3.0	1.5	3	0.8	1.7	0.3	0.8			0.7	
Wellston, Lincoln Co., 3-13n-2e	8.0	4.5	6	2.4	3.4	0.6	1.7			2.0	
Enserch Processing Partners Ltd.—											
Wallville, Garvin Co., 27-4n-3w	6.0	2.3	[2]2						2.5		
Exxon Co. USA—Camargo, Dewey Co., 10-18n-19w	15.0	4.0	[19]2		4.1				4.0		
Dover-Hennessey, Kingfisher Co., 1-18n-7w	80.0	40.0	6						180.0		
Kerr-McGee Corp.—											
Marlow, Stephens Co., 18-2n-7w	2.0	NR	3						1.4		
Milfay, Creek Co., 21-15n-7e	12.0	NR	2		4.4				8.3		
Koch Hydrocarbon Co.—Fitts, Pontotoc Co., 30-2n-7e	5.0	1.3	3		1.8				4.6		
Ladd Petroleum Corp.—Beaver Co., 30 4n-20ecm	40.0	28.0	7						55.5		
Marathon Oil Co.—Cox City, Grady Co., se4 17-3n-5w	3.0	2.0	3						1.4		
Maxus Exploration Co.—Roger Mills Co. 1/4 21-w-15	30.0	21.0	7	0.8	0.4	0.1	0.1			0.1	
McMoRan Oil & Gas Co.—Tyrone, Texas Co., sw1/4 19-6n-19 ecm	36.0	20.4	7						51.0		
Meridian Reserves Inc.—											
Enterprise, Payne Co., ne1/4 25-18n-5e	5.0	0.9	3						1.0		
HJD, Pawnee Co., nw1/4 7-20n-8e	6.0	1.5	3						2.0		
Lincoln Gas, Lincoln Co., se1/4 2-14n-5e	5.0	0.5	4								
Meridian Energy, Lincoln Co., sw1/4 1-14n-5e	10.0	2.1	3						2.5		
Mid-America, Pawnee Co., e1/2 30-20n-8e	5.0	0.5	3						1.0		
Patriot, Creek Co., w1/2 7-17n-8e	3.0	0.5	3						0.5		
Poll Gas, Lincoln Co., e1/2 23-14n-2e	10.0	3.5	3						1.0		
Mesa Limited Partnership—											
Binger, Caddo Co., 26-10n-11w	15.0	5.0	7						24.1		
Madill, Marshall Co., 32-7e-5s	25.0	16.5	[1]2		21.8	2.1	6.9			7.4	
Ringwood, Major Co., 11-22n-10w	80.0	45.5	[1]2-7						135.1		
Mobil Oil Corp.—											
Chitwood, Grady Co., 34-5n-6w	90.0	69.2	7					244.0			
NE Trail, Dewey Co., 1-17n-18w	34.0	27.0	[1]2					48.0			
Postle Hough, Texas Co., 13-5n-13ecm	23.0	12.7	[1]2					20.0			
*Putnam-Oswego, Dewey Co., 35-16n-16w	50.0	35.4	7					15.0			
*Seiling, Woodward Co., 32-20n-17w	20.0	0.7	3	(All products fractionated at NE Trail)							
Sholem Alechem, Stephens Co., 2-1s-4w	70.0	35.3	7					145.0			
Oklahoma Gas Pipeline Co.—Tyrone, Texas Co., sw1/4 11-6n-18e	65.0	46.0	7						69.6		
Oryx Energy Co.—Burlington, Alfalfa Co.	3.0	0.8	3						0.8		
Carney, Lincoln Co., 12-15n-2e	15.0	13.4	7						53.9		
Goldsby Central, McClain Co., 3-7n-3w	65.0	45.6	7						211.1		
Laverne, Harper Co., 20-26n-25w	200.0	97.1	7		54.3	14.0	28.5			26.5	[5]182.2 [11]7.1
Norge, Grady Co.	5.0	4.5	3						18.1		
Wakita, Grant Co., 5-27n-7w	15.0	19.4	[19]2						48.7		[11]2.1
Oxy NGL Inc.—											
Ambrose, Kay Co., sw4 9-27n-1w	400.0	219.8	2	10.0	100.0	23.0	41.0			40.0	[5]14.0
Garrett, Kay Co., ne4-ne4 34-27n-1e	12.0	6.2	4						18.0		
Murdock, Texas Co., 32-5n-16ecm	40.0	12.4	7						42.0		
Rodman, Garfield Co., 27-20n-8w	40.0	30.3	7						119.0		
Phillips 66 Natural Gas Co.—Aline, Alfalfa Co., 7-23n-11w	35.0	34.5	2						51.9		
Cimarron, Woodward Co., e2 ne4 27-20n-17w	66.0	63.4	7						204.1		
Creek, Tulsa Co., s2 sw4 nw4 7-17n-13e	25.0	21.5	7						59.2		
Fox, Carter, Co., 28-2s-3w	50.0	34.5	7						145.8		
Kingfisher Co., nw4 sw4 9-15n-5w	200.0	118.1	7						534.1		

Company, plant, location	MMcfd Gas capacity	Gas throughput	Process/condition method	Production—1,000 gpd (Average based on the past 12 months) Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Lucien, Noble Co., 18-20n-2w	22.0	10.9	3-7						47.1		
Okarche, Kingfisher Co., se4 ne4 31-15n-8w	165.0	115.0	7						393.0		
Seiling, Dewey Co.	75.0	40.8	7						55.6		
Tejas Gas Corp.—											
Antioch, Garvin Co., 17-3n-2w	10.0	5.9	3					16.0			
Pauls Valley, Garvin Co., 12-3n-1w	1.0	0.3	3					0.9			
West Guthrie, Logan Co., 30-15n-2w	15.0	11.0	7					40.0			
Texaco Inc.—Enville, Love Co., 7-7s-3e	15.0	11.3	7						21.5		[11]1.3
Maysville, Garvin Co., 18-4n-2w	114.0	107.7	7	232.4	138.6	15.0	52.6			56.4	
Texaco Producing Inc.—											
Camrick, Beaver Co., 31-1n-20 ecm	14.0	4.1	7						18.5		
Kellyville, Creek Co., ne 27-17n-10e	15.0	1.1	6						5.2		[11]0.3
Velma, Stephens Co., 23-1s-5w	100.0	58.7	7						238.2		[11]4.4
Texas Oil & Gas Corp.—											
Antelope Hills, Roger Mills Co., 30-16n-24w	50.0	35.5	7						75.5		[11]0.5
Beaver Co., 9-1n-27e	50.0	39.6	7						76.4		[11]0.7
Cimarron, Blaine Co., nw4 24-18n-13w	90.0	2.6	7						2.8		[11]1.6
Custer Co., sw4 nw4 34-14n-16w	105.0	70.0	7						179.0		[11]0.1
El Reno, Canadian Co., nw4 sw4 33-14n-7w	75.0	48.5	7						120.8		[11]5.2
Stephens, Stephens Co., 14-1s-r5w	25.0		7								
Watonga, Kingfisher Co., w2 se4 35-15n-9w	40.0		7								[11]0.2
Woodward Co., sw4 nw4 29-23n-21w	75.0	42.7	7						83.2		[11]1.7
Union Pacific Resources—Enid, Garfield Co., 34-23n-6w	35.0	16.9	[21]2					53.9		9.8	
Union Texas Petroleum Corp.—											
Chaney Dell, Major Co., 35-23n-10w	130.0	84.1	[19]2-7	97.6	78.9	12.2	29.1			50.3	
Chester, Woodward Co., 2-20n-17w	37.0	24.6	6-7	23.5	16.1	2.8	6.4			9.7	
Lamont, Grant Co., 19-26n-3w	30.0	27.5	7	62.2	49.5	6.0	17.3			19.5	
Unocal—Caddo, Carter Co., 23-36-1e	10.0	3.4	3		4.4				3.9		[11]0.2
Valero Hydrocarbons Co.—											
Elk City, Beckham Co., 15-10n-21w	85.0	79.4	7	20.5	23.0	4.5	8.4		9.2		
Tecumseh, Pottawatomie Co., ne4 29-10n-3e	14.0	10.0	3	9.0	15.4	2.0	6.3		4.6		
Warren Petroleum Co.—											
Kingfisher Co., 11-15n-9w	NR	8.9	7						18.8		
Knox, Grady Co., 33-3n-5w	NR	14.5	[19]2		2.9				10.5		[11]5.6
Leedey, Roger Mills Co., 32-16n-21w	NR	28.3	7						101.5		
Mocane, Beaver Co., 18-5n-25e ecm	NR	39.9	[19]2						107.4		
Total	**4,613.5**	**2,846.6**		**740.0**	**775.7**	**109.5**	**283.1**	**798.4**	**4,181.9**	**316.6**	**234.8**

PENNSYLVANIA

Company, plant, location	Gas capacity	Gas throughput	Process/condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Tembec Co.—Waynesburg, Greene Co.	14.0	7.9	3		4.1		3.3			3.9	
Waynesburg, Greene Co.			†		(2.5)		(1.7)			(1.5)	
Total	**14.0**	**7.9**		.....	**4.1**	.....	**3.3**	.....	.....	**3.9**	.....

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†Fractionation. (Figures in parenthesis do not represent primary production, and are not added in state totals)

TEXAS

Company, plant, location	Gas capacity	Gas throughput	Process/condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Adobe Gas Gathering & Processing Co.—Apple Creek, Glasscock Co., 7-32-4s	30.0	19.2	7						144.7		
Adobe Resources Corp.—Sale Ranch, Martin Co., 23-37-1n	16.0	11.0	[19]2						71.0		
Amax Oil & Gas Co.—Rocker B I, 17 miles ne of Big Lake	16.0	5.0	7						30.0		
American Central Gas Cos. Inc.—Foster, Ector Co., sw 18-42, TSST & PRR	20.0	14.0	7						130.0		
Live Oak	20.0	20.0	7						50.0		
Amoco Gas Co.—Texas City, Galveston Co., 1,814 acre tract in John Grant A-72	60.0	35.0	7						8.5		[5]1.9
Amoco Production Co.—											
Anton-Irish, Hale Co., 14-DT HE&WT RR	12.0	2.0	3						17.5		
Cedar Lake, Gaines Co.	3.0	1.0	[4]2						6.6		
Edgewood, Van Zandt Co., 2 Roberts A-702	60.0	30.0	[19,40]2		12.1		21.5				[11]38.9
Hastings, Brazoria Co., 1-ACH-DA-416	70.0	55.0	7							15.7	[5]6.8
Mallett CO$_2$ removal, Hockley Co., Labors 16, 17 League 49 Scurry Co. School Land	140.0	56.0	1-5						28.1		
Midland Farms, Andrews Co., 842-T-T-N G&MMB&A	30.0	24.0	7						155.8		
Monahans, Winkler Co., 24-10 PSL	5.0	3.0	3						8.2		
North Cowden, Ector Co., 34-5-43-1M T&P RR	25.0	20.0	7		49.9		64.5				[5]39.6
Old Ocean, Brazoria Co., Charles Breen League A-46	175.0	94.0	7	58.6	28.2	9.1	9.5			35.5	
Slaughter, Hockley Co., 14-15-59 Edwards, & Scurry CSL	57.0	45.0	7		130.6		92.6			101.0	[5]188.7 [11]1.0
South Fullerton, Andrews Co., 8-A 48 PSL	10.0	9.0	7						81.8		
Wasson ODC CO$_2$, Yoakum Co., 805-D, JH Gibson Survey	80.0	50.0	2						84.0		
West Yantis, Wood Co., 3 Oscar Engledon A-181	25.0	7.0	3								[11]32.0
ARCO Oil and Gas Co.—*Block 31, Crane Co., 33-31 Univ. Lands	265.0	291.0	3-7	174.4	125.5	14.4	60.9			59.7	
Carthage			3	0.3	0.6	0.4	0.6			2.0	
*Crane, Upton Co., 128-D CCS&RR Co.	15.0	10.0	3	12.5	11.1	1.7	5.1			5.1	[11]1.1
El Dorado, Schleicher Co., 81-TT-TC RR	15.0	13.5	7	34.4	26.0	4.4	9.9			7.2	[11]5.4
Fashing, Atascosa & Karnes Co., 131 Wm. Smith	12.0	2.7	[19]5		0.1		0.2			0.5	
Longview, Gregg Co., J. Moseley	35.0	8.2	7	45.4	64.5	12.6	28.7			30.6	[11]1.5
Nueces River, Live Oak Co., Cameron CSL 32-A-34	90.0	75.1	3		20.7		19.4			16.7	
Price, Rusk Co., George W. Brooks A-4	15.0	2.4	3-7	2.0	4.9	1.4	3.3			5.1	[11]0.5

	MMcfd			Production—1,000 gpd (Average based on the past 12 months)							
Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Silsbee, Hardin Co., George W. Brooks A-4	15.0	24.2	7	29.1	30.5	6.9	8.7			8.7	[11]1.4
Taft, San Patricio Co., Coleman Fulton Pasture Land	40.0	15.8	[26]2		3.8		3.6			3.3	[11]0.5
Arkla Inc.—Jefferson, Marion Co., Heirs of John Hanks A-188	3.0	0.6	3						0.4		
Waskom, Harrison Co., J. Blair	65.0	NR	3						20.0		
Willow Springs, Gregg Co., P. P. Rains	10.0	NR	3						6.5		
Associated Natural Gas Inc.—Wilcox, Lavaca Co., JR Ragsdale A-377	235.0	150.0	2	8.5	8.5		5.5			5.5	
BHP Petroleum—Diamond M, Scurry Co., se¼ 182-97 H&TC	18.0	13.0	6	43.2	58.2	8.0	23.4			22.6	[11]0.9
Birthright Gas Processing Ltd.—											
Birthright, Hopkins Co., Linecum A-561 and Hargrave A-426	12.0	4.0	3		4.5				8.0		[10]2.5
Black Hawk Gasoline Corp.—Jack Co., R. Stanton, A-1329	1.5	0.5	3-4					1.5	<0.1		
Bruin Petroleum Inc.—Clarkson, Sutton Co.	20.0	18.0	7						35.0		
Hainesville, Wood Co.	6.0	4.0	3						8.0		
Trinidad, Henderson Co.	1.5	0.7	3						2.0		
Urbana, San Jacinto Co.	4.0	1.2	3						2.5		
Cabot Transmission Corp.—											
Arrington, Hemphill Co., 62-A-2 H&GNRR	40.0	29.7	2						37.6		
Carson Co., 4-5-I&GN	20.0	14.5	7						59.4		
East Goldsmith, Ector Co., 44-34, 1n,T&PRR	35.0	9.7	2-7						16.9		
Estes, Ward Co., 3-16 Univ. Land	11.5	6.7	7						39.7		
Gray Co., 152-3 I&GN	20.0	12.9	7						70.6		
Kingsmill, Gray Co., 152-3-I&GN	24.5	16.3	7						84.0		
Turkey Creek, Potter Co., 36-M20-G&M	40.0	27.1	2						84.3		
Walton, Winkler Co., 11-26 PSL	33.5	29.4	7						99.4		
Yake-Merchant, Moore Co., NW corner, J.W. Proctor survey	10.0		6								
Clajon Gas Co., A&M, Burleson Co., John P. Coles A-12	65.0	33.9	7	56.3	36.9	7.8	14.0			10.8	
La Grange, Fayette Co., James Green A-189	200.0	66.4	7	133.0	76.7	18.4	29.1			28.9	
Conoco Inc.—Chittim, Maurice Co., 35-6	5.0	1.1	3		3.8		4.4			2.4	
Hamlin, Fisher Co., 9-R-26	15.0	8.3	7						41.9		
Ramsey, Reeves Co., nw¼ 36-58-1	11.0	7.2	6		10.7		6.7			5.9	
Damson Gas Processing Corp.—											
Caddo, Stephens Co., 77 T&P RR 5	1.0	0.8	4						4.0		
Cargray, Carson Co., 46-4 I&GN	30.0	11.0	7	16.3	12.8				20.4		
Ibex, Shackelford Co., nw¼ 28 BAL	10.0	4.5	[10]1		9.7		3.3			5.9	
South Bend, Young Co., J. Garrett	10.0	4.5	[10]1		9.7		3.3			5.9	
Sterling Co., 10-22 H&TC	30.0	20.0	6						53.0		
Woodlawn, Harrison Co.	100.0	25.0	[19]1						20.0		
Davis Gas Processing Inc.—Big Lake, Reagan Co., 8 miles e of Big Lake	12.0	9.0	[1]2						36.0		
Bowie, Montague Co., 3 miles ne of Bowie	8.0	3.0	3		6.0				6.0		
Concho, Concho Co., 4 miles s of Paint Rock	10.0	3.0	[1]2		3.5				3.5		
Irion (Rocker B-2), Irion Co., 8 miles n of Barnhart	16.0	6.0	[1]2						36.0		
Neleh, 5 miles sw of McCamey	6.0	3.0	6						18.0		
Robstown, Nueces Co., Fuente A-3, Simmons & Perry subdivision	8.0	3.0	7						6.0		
Stiles, Reagan Co., 5 miles nw of Texon	8.0	3.5	[1]2						22.0		
Texon, Reagan Co., 12 miles west of Big Lake	6.0	4.0	3						4.0		
Davis, J.L.—Claytonville, Fisher Co., 211-3 H&TC RR, 12 mi n of Roscoe	6.0	2.0	6						12.0		
Peach Creek, Lavaca Co., A-32	15.0	2.0	7						6.0		
Pearsall, Frio Co., 1-A-307 Henry Castro	8.0	3.0	3						12.0		
Diamond Shamrock R&M Inc.—McKee, Moore Co., 399-44 H&TC	375.0	215.4	[24,33]2-7		199.8	46.1	106.1		156.4		[1]359.9
Eagle Petroleum Corp.—Eagle-Thriftway, Young Co.	0.5	0.2	3						1.9		
Holliday No. 2, Archer Co.	1.5	0.4	3						1.1		
El Paso Natural Gas Co.—Midkiff, Reagan Co., nw4 n2 sw4-22 T&PRR 37-5-5	168.0	64.3	[19]1	88.9	159.6		67.5			59.0	
Wilshire, Upton Co., e2 ne4 ne4 & ne4 se4 ne4 135E CCSD & RGNG RR	30.0	25.0	4						2.8		
Endevco Natural Gas Co.—Bear Wallow Brazoria Co., Oliver Jones A-78	45.0	22.0	7						22.0		
Gun Point, Dewitt Co.	50.0	20.0	[20]5								
Seven Sisters, Duval Co.	35.0	2.0	[20]5								
Enerfin Partners I Ltd.—											
Bailey, Schleicher Co., 522-TT	15.0	13.3	7						71.9		[11]7.5
Eldorado, Schleicher-Irion-Reagan Cos., 33-M-GH&SA	35.0	35.9	7						54.2		[11]21.0
Mertzon, Schleicher-Irion-Tom Green Cos., Tom Green CSL-1	50.0	30.3	7						134.8		[11]23.7
Quitman, Wood Co., S.G. Purse A-456	6.5	3.2	3						17.8		[11]0.1
Enron Gas Processing Co.—											
DuBose, Gonzales	35.0	4.0	[21,35]1								[11]0.1
Encinal, Webb Co.	35.0	19.6	7		8.3		5.6			6.1	
Gregory, San Patricio Co., Geranimo Valdez A-269	70.0	41.6	[19]2		23.6		13.8			8.6	
Imperial, Crane Co., 20&21 1 H&TC RR-1	18.0	15.9	7						47.0		
Lipan, Hood Co., J.R. Anderson A-11	15.0	6.8	7						36.0		
McMullen Co.	15.0	12.8	3		15.3		12.5			8.9	
Martin Co. No. 1, 31-37-2n TYP RR	10.0	8.9	3						46.3		
Martin Co. No. 2 4-HA	5.0	3.0	3						16.0		
Middle Concho, sw4 90-14 H&TC RR Co.	10.0	3.7	6						20.0		
Robstown, Nueces Co., Mathis Garcia A-116	80.0	34.0	[19]2	5.5	8.0		6.1			3.2	
Sonora, Sutton Co., HE&WT RR A-352	55.0	63.8	[19]2		17.8		21.3			13.2	

Company, plant, location	MMcfd			Production—1,000 gpd (Average based on the past 12 months)							
	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Victoria Co., James Reed A-236	60.0	26.7	[19]2		9.0		5.6			5.0	
Enserch Processing Partners Ltd.—											
Chico, Jack Co., J.U. Fields A-218	30.0	14.9	7						71.8		
Decatur, Wise Co., David Moses A-357	18.0	9.9	7						41.0		
Gilliland, Knox Co., C of H&TC RR	14.0	1.9	3						2.9		
Gordon, Palo Pinto Co., Thomas Reed A-384	50.0	40.8	7						144.3		
Madisonville, Madison Co., Alfred Gee A-16	20.0	15.6	[28]5						1.6		
Novice, Coleman Co., T&NO RR Co. 24-2	4.5	3.5	3						5.1		
Pueblo, Eastland Co., SPRR-464	20.0	15.7	7						86.6		
Ranger, Eastland Co., H&TC RR 4-4	18.0	16.3	3						101.8		
Reprieve, Hardeman Co., L. Bechtol, 2	3.0	1.8	3						7.1		
Santa Anna, Parker Co., Mary Ann Fisk 360, A-195	5.0	3.3	3						2.8		
Springtown, Parker Co., JL Hodges A-690	80.0	58.1	7		179.5						
Trinidad, Henderson Co., No. Addison A-17	65.0	62.5	7		113.4						
Exxon Co. USA—Clear Lake, Harris Co., James Lindsey A-43	150.0	125.0	[19]2						99.2		
Conroe, Montgomery Co., Ransom House	125.0	115.0	[19]2-7						81.9		
Cordona Lake GCF, Crane Co., nw¼ Juan Cordona Survey	10.0		4	(Hydrocarbon and CO_2 mix. CO_2 is reinjected)							
East Texas, Rusk, T. J. Martin	25.0	5.0	3-6						35.0		[5]41.0
Hawkins, Wood Co., H. Watson	110.0	108.0	[19]2	9.6	40.0	17.5	24.0			38.5	
Hawkins Cryogenic, Wood Co., H. Watson	30.0	20.0	7	9.0	9.0	3.0	3.4			8.5	
Heyser, Calhoun Co., Agaton Sisneros A-36	30.0	18.0	7	1.8	0.7	0.3	0.3			1.3	
Katy, Waller Co., T. S. Reese 110, A-332	960.0	350.0	[19]2	430.0	163.0	33.0	141.0				
King Ranch, Kleberg Co., R. King A-172	1,000.0	554.0	[19]2	301.7	125.0	41.5	38.0			89.8	
Means GCF, Andrews Co., PSL A-35 nw corner of 12	40.0	25.0	4	(Hydrocarbon and CO_2 mix. CO_2 is reinjected)							
Neches, Cherokee Co., J. H. Shaw	30.0	25.0	[19]2						34.0		
Pyote, Ward Co., 32-16 ULS	100.0	52.0	7						73.3		
Sabine Lake, Orange Co., Wm. A. Davis A-7	25.0	15.0	7						44.0		
Sandhills, Crane Co., 18-32 PSL	65.0	25.0	7						116.3		
Sarita, Kenedy Co., J. A. Balli A-2	95.0	42.0	7	20.6	10.6	4.4	3.7			7.5	
Tom O'Connor, Refugio Co., Maria Ximines A-324	165.0	139.0	7	46.1	20.5	9.8	9.8			44.4	
Fina Oil & Chemical—											
McAllen Ranch, Hidalgo Co.	26.0	NR	2								
Fort Chadbourne Corp.—Box Elmdale, Callahan Co., 4 miles e of Abilene	4.0	2.0	3						4.0		
Tuscola, Taylor Co., 2 miles w of Tuscola	4.0	3.0	3						6.0		
Hunt Oil Co.—*Fairway, Henderson Co., Jose Mora A-497	87.5	63.2	[1,40]2						118.0		
*Pecos Valley, Pecos Co., 106-T&ST-L	10.0	2.9	3						3.2		
Kerr-McGee Corp.—Chapel Hill #35, Smith Co., Stillwell Box A-169	35.0	NR	7		12.2		9.7		13.3		
Hobart Ranch, Hemphill Co., 70 A-2 N&GN	43.5	NR	7						73.0		
Ladd Petroleum Corp.—Southwest Ozona, Crockett Co., 2-2 HGN RR 28 mi sw of Ozona township	25.0	18.8	[19]2						76.2		
Wharton, El Campo, A-246 I&GN RR	20.0	18.9	7						48.3		
Mapco Westpan Inc.—Bivins, Moore Co., 33-PMc, ELRR	100.0	6.6	[46]2						17.3		
Fritch 950, Hutchinson Co., 92-Y2-TTRR	60.0	25.2	[45]2						98.6		
Fritch 1000, Hutchinson Co., 92-Y2-TTRR	100.0		[45]2								
Marathon Oil Co.—Markham, Matagorda Co. 4-9-9	21.0	17.8	3					2.9			
Susan Peak, Tom Green Co., 193 SPRR-11	3.3	2.6	3						5.4	0.7	
Weider, San Patricio Co., 49 Robert Montgomery 199 and Ewan Cameron A-97	55.0	12.6	[19]1					3.0			
*Yates, Pecos Co., I.G. Yates, 194 SF 1234-1	72.0	74.1	3-7						70.1		[11]2.2
Meridian Oil Hydrocarbons Co., Benedum Plant, Upton Co., w2 46 Y MK&T RR	90.0	93.0	7						418.0		
Santa Rosa Plant, Pecos Co., 2-105 8 H&GN RR	20.0	12.8	7						67.0		
Mesa Limited Partnership—Fain, Potter Co., G&M 10-181-B	80.0	57.1	7						186.1		
Mills Bennett Estate—Brooks Co., El Tule Grant A-257	8.0	1.2	3						1.2		
Mitchell Energy & Development Corp.—											
Alabama Ferry, Madison Co.	5.0	4.7	3						9.2		
Barton Chapel 1, Jack Co.	15.0	9.3	7						38.7		
Barton Chapel 2, Jack Co.	20.0	12.4	7						51.5		
Bridgeport 1, Wise Co.	150.0	114.0	7		146.7	17.2	19.4		346.7	48.6	[11]12.9
Bridgeport 2, Wise Co.	20.0	15.2	7		19.6	2.3	2.6		46.2	6.5	[11]1.7
Bridgeport 3, Wise Co.	20.0	15.2	7		19.6	2.3	2.6		46.2	6.5	[11]1.7
Bryan Hicks, Brazos Co.	20.0	10.4	7						57.7		
Cisco, Eastland Co.	15.0	9.6	7						50.1		
Gum Island, Jefferson Co.	40.0	9.8	7						31.0		
Huckabay No. 1, Erath Co.	15.0	8.6	7						32.8		
Huckabay No. 2, Erath Co.	15.0	8.6	7						32.8		
Huckabay No. 3, Erath Co.	15.0	8.6	7						32.8		
Lone Camp No. 2, Palo Pinto Co.	10.0	4.5	7						26.8		[11]0.1
Lone Camp No. 3, Palo Pinto Co.	10.0	4.5	7						26.8		[11]0.1
Lone Camp No. 4, Palo Pinto	30.0	13.5	7						80.3		[11]0.4
Mineral Wells, Palo Pinto Co.	15.0	9.9	7						56.9		[11]<0.1
Morgan Mill No. 1, Erath Co.	15.0	4.4	7						17.4		
Morgan Mill No. 2, Erath Co.	15.0	4.4	7						17.4		
Morgan Mill No. 3, Erath Co.	20.0	5.9	7						23.2		
Ponder, Denton Co.	2.0	1.5	6						3.4		[11]7.6
Port Arthur, Jefferson Co.	115.0	83.4	7						68.4		
Port Arthur II, Jefferson Co.	20.0	13.8	7						11.4		
Schreiner Ranch, Live Oak Co.	20.0	5.2	7						15.5		
Sheffield, Pecos Co.	15.0	1.8	7						4.6		[11]10.5
Springtown, Parker Co.	15.0	10.1	7						24.1		

Company, plant, location	MMcfd Gas capacity	Gas throughput	Process/ condition method	Production—1,000 gpd (Average based on the past 12 months) Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Wellborn, Brazos Co.	5.0	1.2	3	32.6	22.4	3.2	7.3		10.5		
Winnie, Jefferson Co.	75.0	66.2	7						63.4		
Mobil Exploration-Producing U.S. Inc.—											
East White Point, San Patricio Co., G.H. Paul subdiv. of Coleman Fulton Pasture Lands	25.0	8.9	7						12.0		
LaGloria, Jim Wells Co., 9-3 Rangeland 7 Herring subdiv. LaGloria Townsite subdiv.	265.0	145.1	7	177.5	88.7	28.9	22.9			63.8	[11]11.7
*Lake Creek, Montgomery Co.	5.5	5.8	7	2.0	2.7	0.7	0.9			1.7	
*Portillo, San Patricio Co., M. S. Welder	15.0	17.7	7	3.0	3.1	1.2	1.6			5.7	
Vanderbilt, Jackson Co., R. Musquex A-59	48.0	48.0	2				5.0			9.6	[5]7.3 [11]2.1
Mobil Oil Corp.—*Coyanosa, Pecos Co., 48-OW TTRR	125.0	113.0	7						186.4		[11]95.0
East Canadian, Hemphill Co., David Crockett	50.0	7.7	7					25.0			
Electra, Wilbarger Co., 17-13 H&TC RR	1.2	0.9	3						11.2		
Feldman, Hemphill Co., H&TC RR 42-44	3.0	3.0	6					3.8			
*Pegasus, Midland Co., e2 30-40-4s T&PRR	90.0	86.0	7	111.0					180.1		
Salt Creek, Kent Co., W&NW RR G-193	23.0	18.0	3						210.2		
Sandhills, Crane Co., Sec. 4, Blk 32, Public School Land	25.0	6.8	[7,13]1								
University Waddell, Crane Co., Sec. 1, Blk. 31, University Lands	1.5	1.1	[13,21]1								
Waha, Pecos Co., 5-C3 PSL	125.0	57.0	7						121.8		[11]1.6
Will-O-Mills, Val Verde Co., Sec. 9, Blk Q4, TCRR	25.0	13.5	[13,20]1								
Natural Gas Pipeline Co. of America— CP 170, Moore Co., w½ of nw¼ section 1 of TTRR	80.0	60.3	7						178.8		
Oryx Energy Co.—Big Wells, Dimmit Co., I&GN A-223 82-1	20.0	5.6	[19]2		4.9		3.2			6.0	
*Desdemona, Eastland Co.	NR	0.8	3						4.3		
Jameson, Coke Co., 315-1A N&TCRR	70.0	34.8	6-7		47.6		45.9			35.6	[5]164.5 [10]0.8
Snyder, Scurry Co., 16-1 JP Smith	50.0	40.8	7		86.5		75.1		332.2	81.0	[11]1.5
Sun, Starr Co., 239 AB-225 CCSDR RGN GRR	120.0	108.4	7		32.6		34.1		41.4		[5]71.6
Tijerina-Canales, Jim Wells Co., 343 CCSD&R GNG RR A-119	40.0	17.8	[19]2		6.4		7.3			4.2	[5]19.1
Oxy NGL Inc.—Chico, Wise Co., 3 GH&HRR A-384	100.0	70.0	7						425.0		[11]9.0
East Texas, Gregg Co., William Castleberry A-38	27.0	23.0	7					87.0			[5]117.0
Flatrock Creek, Young Co., 6 acres, M. Case A-1402, (File 8 NGL 2630)	10.0	9.1	2						32.0		
Graham, Young Co., 4 acres e 53½ acres subdiv. 15, TE&L A-3412 (File 10-NGL 2631)	7.0	3.1	3						3.0		
Lefors, Gray Co., 2-1-ACH&B	11.6	7.9	7					79.0			
Mont Belvieu fractionation, Chambers Co., Henry Griffin, League A-12			†	(1,292.0)	(939.0)	(191.0)	(412.0)			(365.0)	
Myrtle Springs, Van Zandt Co., J. Salingua A-765	30.0	23.0	2		17.0		17.0			9.0	[11]121.0
*Roberts Ranch, Midland Co., 16-41-3s T&PRR	85.0	70.2	7						147.0		
Welch, Dawson Co., 67 M, EL&RR	2.5	1.3	2						15.0		
*West Seminole, Gaines Co., 335 GCSD & RGNG RR	30.0	13.0	7						60.0		
Permian Operating Ltd. Partnership—											
Possum Kingdom, Stephens Co., E. Romerhausen A-149	5.0	2.0	3						5.4		
Todd, Crockett, 28-WX GC&SF RR	5.0	3.5	3						12.0		
Phillips, Jack L.—Nan Su Gail, Freestone Co.	7.0	1.0	3						1.3		
Phillips 66 Natural Gas Co.—											
Crane Co., ne4 216-F CCSD&RGNG RR	25.0	22.6	7						173.8		
Dumas, Moore Co., nw4-181-44 H&TC	120.0	82.7	7						390.2		
Fullerton, Andrews Co., Center S-17 A-32 PSL	62.0	59.1	7						616.3		
Giddings, Fayette Co., David G. Green A-193	75.0	78.5	7						463.7		
Goldsmith, Ector Co., nw4-se4-33-44 T&P-1n	105.0	89.7	7						598.0		
Gray Co., e2-32-2 H&GN	70.0	28.6	2						183.1		
Luling, Caldwell Co., north corner John Henry A-12	12.0	6.3	7						31.8		
Pantex, Hutchinson Co., 8&9 M. Whitley	20.0	11.6	7						120.4		
Puckett, Pecos Co., n2 26-101 TCRR	94.0	62.0	[6]5						3.0		
Rock Creek, Hutchinson Co., nw4-22-y A&B	180.0	128.8	7						655.6		
Sherman, Hansford Co., 7&8-1 PSL	250.0	195.1	7						626.8		
Spraberry, Midland Co., se4-25 3s-37 T&P	27.5	27.5	7						300.0		
Portal Drilling Co.—McMullen Co., Benjamin Odium A-9	2.2		3								
Pronto Gas Products Inc.—Archer City, Archer Co.	1.0	0.1	3						0.6		
Moran, Shackelford Co.	2.0	1.0	3						2.5		
Wall, Tom Green Co.	0.8	0.1	3						1.4		
Seagull Energy Corp.—Matagorda Co., Lot 29 Moore Pasture subdivision	250.0	229.0	7	96.8	53.7	27.2	14.4			37.6	
Shannon Energy Corp.—Mobeetie, Wheeler Co. (Gasoline plant) 46-BLK A-5 H&GN	2.2	1.2	3						2.5		
Gas collection system	5.0	1.2	4								
Shell Smackover Ltd.—Eustace, Henderson Co. Vincente Michelli A-485	70.0	19.6	7						87.4		

Company, plant, location	MMcfd Gas capacity	MMcfd Gas through-put	Process/ condition method	Production—1,000 gpd (Average based on the past 12 months) Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Shell Western E&P Inc.—Armadillo, Pecos Co., GC&SF R-3-5	2.0	1.0	2						2.9		
Big Foot, Frio Co.	0.5	0.3	3						1.7		
*Bryans Mill, Cass Co., B.F. Lynn A-651	70.0	47.9	2		24.1			38.7			
Denver Unit CO_2, Yoakum Co., nw¼ 827 sw¼ 802-D John H. Gibson	140.0	107.5	2	26.7	49.2	9.4	23.2			30.6	
Fandango, Zapata Co.	90.0	88.0	[79]1								
Houston Central, Colorado Co., F. Mayhar A 400 K. Winn A-589	700.0	559.0	2-7	355.2	237.6	56.2	63.0			105.5	[11]40.0
Tippett, Crockett Co., 38-31-H&TC RR	55.0	21.4	6	41.1	26.8			34.1			
TXL, Ector Co., 17-45-1s T&P RR	40.0	25.7	2	47.3	51.8		22.6			23.4	
Wasson, Yoakum Co., nw¼ 827 sw¼ 802-D, John H. Gibson	95.0	53.2	2	47.3	102.3			139.6			[11]11.8
Sid Richardson Carbon & Gasoline Co.—Chalk, Cottle Co., nw¼ of C.L. Carter FP 4480	15.0	6.8	3						12.3		[11]1.2
Eskota, Fisher Co., 11 T&PRR-19	12.0	6.2	6						52.8		
Halley, Winkler Co., e2-22-B11-PSL	60.0	24.5	7						82.9		[11]1.0
Keystone, Winkler Co., 5-B2 & 1&2 B3-PSL	120.0	115.4	7						387.0		[11]<0.1
South Texas Energy Systems LP—Kosciusko, Wilson Co., I mile n of Kosciusko, Tex.	8.0	3.0	3						5.0		
SPG Exploration Corp.—Martha F. Berry, Frio Co., M.C. Patton, 1178 A-542	5.0	3.0	6						7.0		
Ozona, Crockett Co., nw¼ BMN GC&SF RR	60.0	25.0	[19]2		33.0		15.5			8.0	
Tejas Gas Corp., Copano, Aransas	20.0	20.0	7					33.0			
Tenneco Natural Gas Liquids Corp.—Chesterville, Colorado Co., Thomson A-708	80.0	41.4	2						22.6		
Magnolia City, Nueces Co.	60.0	42.2	7						64.6		
Texaco Inc.—Bradford Ranch, Midland Co., 13-39-3s, T&P RR	16.0	19.2	7						55.9		[11]0.9
Burleson Co., JP Coleson A-12	30.0	6.7	6-7						35.4		
George West, Live Oak Co., G.W. West sub D 200&201	23.0	22.4	6-7						6.9		[11]0.2
Handy, Grayson Co., se¼ I&GN RRA-1441	12.0	1.2	[19]2						8.6		
*Headlee Devonian, Ector-Midland Co., ne¼ of nw¼ 29-41-2s T&PRR	190.0	207.0	7						550.8		
Luby, Nueces Co., Canutillo Colony Dutch Co.	20.0	13.6	6-7						20.8		[11]0.8
Mabee, Andrews Co., s¼ 32-40-2n, G&MMB&A	5.0	2.6	6						9.2		
Odem, San Patricio Co., J. Hart & Sons Survey A-10, J.F. Weider Tract	23.0	12.2	7						13.2		
Ozona, Crockett, n½ 3-MN, GC&SF RR	25.0	13.4	7						49.5		
South Kermit, Winkler Co., sw¼ 22 B-3, PSL	42.0	11.7	7						35.0		
Streetman, Freestone Co., A-536, Jefferson Richards	7.5	3.1	6-7						16.6		
Texaco Producing Inc.—											
East Vealmoor, Howard Co., 20-27-H&TC	50.0	38.3	[19]2	122.2	147.3	18.1	58.1			60.4	
Fuller, Scurry Co., ne¼ 652-97 H&TC RR	5.0	4.5	3						50.6		
McLean, Gray Co., 68-23 H&GN RR	26.0	15.5	7						34.2		[11]0.1
*Schafer, Carson Co., 88-4-1n I&GN RR	55.0	26.6	[1]1-7						150.6		[11]0.9
Spearman, Ochiltree Co., 23-R-B&B	50.0	39.2	2		12.9				13.5		
Texas Oil & Gas Corp—											
Booker, Lipscomb Co., w2 sw4 1116-43 H&TC RR	6.0		3								
Coyanosa, Pecos Co., 18-143-T&SL RR	75.0	49.0	7						90.7		[11]0.6
Denton Co., BBB&CRR A-161	30.0	8.6	[19]2						28.4		[11]0.3
East Texas, Marion Co., John H. Kernels A-236	75.0	27.5	7						27.8		[11]1.0
Grapeland, Houston Co., 2 JDJ Procella League A-69	165.0		7								
Laredo, Webb Co., Porcion 14 of N.D. Hachar Estate	30.0	9.4	[19]2						11.9		[11]0.4
Longview, Gregg Co., Frost Thorn A-5	100.0	15.0	7						16.1		[11]0.1
Shackelford, Callahan Co., nw corner 24 sw corner 23 Bayland Orphan Home Land	30.0	9.5	[19]2						33.2		[11]0.1
Three Rivers, Live Oak Co., J.D. Jamison 168 A-268	25.0	5.8	7						15.0		[11]1.2
Union Pacific Resources—Bryan, Brazos	35.0	16.1	6						94.0		
Conger, Glasscock Co.	6.0	3.7	3						7.9		
*Conroe, Montgomery Co.	70.0	60.4	7						64.2		
East Texas, Panola Co.	380.0	353.9	7		1.0				255.2	193.0	[8]367.0
Gulf Plains, Nueces	135.0	87.6	7	96.2	46.8		28.3			73.2	
Lyons 1 & 2, Burleson Co.	25.0	8.3	3						41.7		
Tunis, Burleson Co.	15.0	6.6	3						16.5		
Union Texas Petroleum Corp.—Benedum, Upton Co., Sect. G, C. Bendle A-657	30.0	29.2	7	91.3	65.5	7.4	22.7			27.6	
East Sour Lake, Hardin Co., 384 A-784 J.F. Keith	20.0	17.8	7	5.1	16.1	5.3	5.0			6.3	
Noel, Eastland Co., ne 4 31-3 H&TC RR	30.0	18.8	7	55.0	42.4	5.6	14.5			15.7	
Perkins, Coke Co., 2-H&TC RR	25.0	20.4	7	55.0	50.0	7.7	18.8			17.7	
Walnut Bend, Grayson Co., E.L. Stickney A-1089	10.0	5.8	7	16.0	13.2	2.0	5.4			5.9	
Wellman, Terry Co.	6.0	1.7	7	2.7	6.7	1.1	3.5			4.8	
United Texas Transmission Co.—Galveston Bay, Chambers Co., J. Armstrong A-2	40.0	4.5	7						1.9		[11]0.2
Unocal—Dollarhide, Andrews Co., 25-A52-PSL	13.0	4.5	6						39.1		
*Fort Trinidad, Houston, Co., RCS A-23	40.0	10.8	[38]2		8.3		6.4			5.8	
Van, Van Zandt Co., JWS A-891	15.0	10.2	[38]2		5.0		9.7			11.5	
Upham Oil & Gas Co.—Bridgeport, Wise Co., Wm. Hersee	12.0	6.0	2		8.0		4.9		5.8		
Valero Hydrocarbons Co.—Armstrong, DeWitt Co. James A. Moody A-333	400.0	334.6	2-7	241.3	149.4	32.2	42.7		55.8		
Freer, Webb Co. BS 1-4 A-1954	190.0	173.9	2	18.8	43.7	15.8	16.9		27.4		

Company, plant, location	MMcfd: Gas capacity	MMcfd: Gas throughput	Process/ condition method	Production—1,000 gpd (Average based on the past 12 months): Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Garden City, Sterling Co., 30-22, A-698 H&TC RR	40.0	48.7	3-7	95.3	85.4	9.7	26.1		17.6		
Gilmore, Hidalgo Co., TexMex RR A-211	90.0	76.2	7	71.2	31.6	10.9	9.1		21.8		
Ozona, Crockett Co., 10 45- DP GC&SF RR	20.0	17.2	5-7	13.7	11.8	1.9	3.9		3.9		
San Martin, Bexar Co. 4010 F. Farias 15 A-2	150.0	149.6	7	90.2	61.5	15.2	21.5		31.1		
Shoup, Nueces Co., AB&M 409 A-555	300.0	283.0	3-7	209.9	106.8	34.3	30.7		58.3		
Sonora, Sutton Co., 122, HE&WTRR A-1117	44.0	32.5	7	33.7	24.9	4.1	8.0		8.7		
Sterling plant and field, 11 2-31-5 South T&PRY	40.0	20.2	3-5-7	29.8	28.0	3.4	8.8		6.0		
Warren Petroleum Co.—											
Breckenridge, Stephens Co., n2 22 LAL	NR	11.2	7						62.0		
Canadian, Hemphill Co., 216 G&MMB&A-C	NR	10.5	7						26.5		
Como, Hopkins Co., Nacogdoches Univ. A-703	NR	24.4	7		12.4		12.1			6.2	[11]86.9
Fashing, Atascosa and Karnes Cos., Emma Tar H. et al. tract in James Wilkerson 149 A-882	NR	41.8	[19]2		12.7		8.6			18.7	
Gladewater, Gregg Co., David Ferguson	NR	5.7	7						36.8		§38.7
Monahans, Ward Co., 4-F	NR	19.2	7						81.0		
Moores Orchard, Fort Bend Co., German Emigration No. 8 A-117	NR	6.0	7						10.7		
Sand Hills, Crane Co., 21-PSL B-21	NR	89.2	[19]2-7						396.0		
Shackelford Co., TE&L 522 & 523	NR	9.1	7						54.0		
Sherman North, Grayson Co., Uriah Burns A-121	NR	5.7	[19]2		6.2				5.5		
Sherman South, Grayson Co., James S. Coffee A-232	NR	1.3	4								
Spear, Gregg & Rusk Co., Mary Van Winkler	NR	1.1	7						6.9		§5.4
Tonkawa, Hemphill Co., 78-41 H&TC RR	NR	1.5	3						1.7		
Worsham, Ward Co., 56-34 H&TC RR	NR	6.3	7						16.0		
West Texas Gas Inc.—Markley, Jack Co.	12.0	3.0	4						1.0		
WW Sub Inc.—*Markley, Jack Co., SPRR A-583	2.0	1.0	3						2.7		
Total	**16,786.0**	**10,918.3**		**3,715.1**	**3,938.7**	**564.0**	**1,635.9**	**447.6**	**15,301.4**	**1,603.8**	**1,994.4**

† Fractionation. (Figures in parenthesis do not represent primary production, and are not added in state totals). §Butane-gasoline mix.

UTAH

Company, plant, location	Gas capacity	Gas throughput	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Chevron USA Inc.—Red Wash, Uintah Co. ne4 21 nw4 22-7s-23e	7.0	5.3	†2						2.1		[11]115.0
Coastal Oil & Gas Corp.—Altamont, Duchesne Co., 34-1s-4w	40.0	16.7	3		10.9		8.6			22.5	
El Paso Natural Gas Co.—Aneth, San Juan Co., nw4-6-41s-24e	100.0	10.0	[17]1						57.0		
Gary Energy Corp.—Bluebell, Duchesne Co., sw-nw 23-1s-2w	23.0	12.7	[19]2		12.5				23.1		
Koch Hydrocarbon Co.—Cedar Rim, Duchesne Co., 21-35-6w	12.0	4.8	3		3.4		2.7			6.1	
Marathon Oil Co.—Tin Cup Mesa, San Juan Co., 25-38s-25e	1.5	1.5	3						4.2		
Phillips 66 Natural Gas Co.—											
Bridger Lake, Summit Co., 25-3n-14e	34.0	26.2	7						29.2		
Questar Pipeline Co.—Price, Carbon Co., 8-14s-10e	120.0	87.3	3						3.4		
Union Pacific Resources—Pineview, Summit Co., 3-2n-7e	10.0	2.3	3		5.0				13.0		
Yellow Creek, Summit Co. 16-3n-8e	80.0	46.8	7		23.7				12.2		
Unocal—*Lisbon, San Juan Co., 22-30s-24e	80.0	60.0	3		21.0		12.9			17.2	
Western Gas Processors Ltd.—Four Corners, San Juan Co., se1/4 sec19 24e 38s	15.0	7.9	3						16.2		[11]0.4
Total	**522.5**	**281.5**		....	**76.5**	....	**24.2**	....	**160.4**	**45.8**	**115.4**

WEST VIRGINIA

Company, plant, location	Gas capacity	Gas throughput	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Columbia Gas Transmission Corp.—Cobb, Kanahwa Co., Big Sandy district	35.0	29.5	[19]2						21.5		
Kenova, Wayne Co., Ceredo district	140.0	116.5	[19]2						187.7		
CNG Transmission Corp.—Hastings, Wetzel Co.	150.0	119.1	3	231.9	137.9	22.6	43.3		45.4		
Pennzoil Products Co.— 7 small plants	7.0	3.0	4						1.2		
Tejas Gas Corp.—											
Copley Run, Lewis Co.	40.0	31.0	7					38.2			
Schultz, Pleasants Co.	10.0	8.1	7					24.0			
West Union, Doddridge Co.	15.0	13.0	7					26.0			
Total	**397.0**	**320.2**		**231.9**	**137.9**	**22.6**	**43.3**	**88.2**	**255.8**	....	....

WYOMING

Company, plant, location	Gas capacity	Gas throughput	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Amoco Production Co.—*Anschutz Ranch East, Uinta Co., 26-24-35 13n-121w 6PM	600.0	600.0	7						1,386.0		[11]1,386.0
*Bairoil-Wertz, Sweetwater Co., 7-26n-90w	65.0	65.0	1-4								
Beaver Creek, Fremont Co. 10-33n-96w	65.0	21.0	[19,42]2		11.4		9.0			8.1	
Beaver Creek Phosphoria, Fremont Co., 10-33n-96w	14.0	6.0	4								[11]7.8
Elk Basin, Park Co., 29-48n-99w	17.0	10.0	[19,44]2		17.3		14.4			18.1	
Painter NRU-NGL, Uinta Co., sw¼ 32 16n-119w	240.0	104.0	7							585.6	[11]28.4
Whitney Canyon, Uinta Co., 17-17n-119w	275.0	168.0	7						151.1		[11]129.4
ARCO Oil & Gas Co.—Gillette, Campbell Co., 18-50n-73w	31.0	6.4	3		13.3		3.5			3.0	[11]0.2

Company, plant, location	MMcfd Gas capacity	MMcfd Gas through-put	Process/ condition method	Production—1,000 gpd (Average based on the past 12 months) Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Riverton Dome, Fremont Co., 36-1s-4e	30.0	3.7	[26]2							1.3	....
Chevron USA Inc.—Carter Creek, Uinta Co., 6-18n-119w	150.0	130.0	[7]2					....	70.4		[11]115.0
Colorado Interstate Gas Co.—Rawlins, Carbon Co., sw4-sw4 25-21n-86w	200.0	185.4	2		28.2		58.2		*	37.2	
Enerfin Partners I Ltd.—Gillette, Campbell Co., 1-49n-74w	6.0	1.4	3		3.3				4.2		....
Enron Gas Processing Co.—Painter, Uinta Co. nw4 6-15n-119w	35.0	53.6	3						123.3		
Exxon Co. USA—Shute Creek, Lincoln Co., 22n-112w-14	550.0	510.0	[29-35]1 [29]2 [23]5								
KN Energy Inc.—Casper, Natrona Co. 10-33n-78w	80.0	43.2	1		13.0		4.2			3.1	
Flat Top, Converse Co., 20-33n-68w	5.0	1.6	1		2.4			2.7			
Lawrence-Allison & Associates West Inc.—NPR 3 Teapot Dome, Natrona Co., swne 4 38n-78w	10.0	11.0	3		3.7					7.8	
Marathon Oil Co.—Oregon Basin, Park Co., 29-51n-100w	6.5	5.0	4						14.5		
Rock River, Carbon Co., 34-19n-78w	0.5	0.2	3						0.4		
Northwest Pipeline Corp.—Moxa Arch, Lincoln Co., 19-19n-112w	30.0	21.1	[31]5						2.4		
Opal, Lincoln Co., 27-21n-114w	400.0	210.0	[19]2-7		86.0		60.0		119.0	30.0	
Oryx Energy Co.—Lucky Ditch, Uinta Co.	15.0	21.4	3						23.7		
Sun Ranch Federal, Natrona Co.—15-33n-86w	5.0	1.9	3						2.1		
Phillips Petroleum Co.—Douglas, Converse Co., se4-ne4 34-33n-71w	95.0	56.2	7						319.5		
Ralston Processing Associates Inc.—Oregon Basin, Park Co., 8-52n-100w	15.0	8.5	7		3.5		2.4			1.9	
Union Pacific Resources—*Brady, Sweetwater Co., 11-16n-101w	65.0	65.0	[19]2		21.3	9.5	15.9			27.9	
Emigrant Trail, Uinta Co., 1-16n-113w	60.0	31.5	7						32.4		
Manning, Converse Co., 15-39n-73w	3.0	0.3	3						0.4		
Patrick Draw, Sweetwater Co., 25-19n-99w	25.0	18.9	7		16.9	3.4	5.5			7.3	
Unocal—Worland, Washakie Co., 17-48n-92w	15.0	11.1	7		12.5		6.4			4.3	
Western Gas Processors Ltd.—Amos Draw, Campbell Co., se¼ nw¼ 32-1n-75w	32.5	19.4	3						38.0		[11]1.6
Hartzog Draw, Campbell Co., nw¼ ne¼ 11-45n-76w, 6th PM	6.0	7.8	3						21.2		[11]3.4
Hilight, Campbell Co., 26 sw14-45n-71w	60.0	18.0	3		25.4		13.6		8.4		[11]1.0
Lincoln Road, Sweetwater Co., 107 w17n	45.0	28.0	3						43.9		
Newcastle, Weston Co., n2-nw4 9-42n-64w	5.0	3.0	3		9.6			10.4			[11]1.0
Oedekoven, Campbell Co. 45 55n-73w	12.0	3.9	3		0.7			1.3	3.2		[11](0.1
Spearhead, Converse Co., 13-79n-75w	21.0	7.6	2						13.3		
Woods Petroleum Corp.—*Powell, Converse Co., 38-39-40n 73&74w	40.0	36.0	3					42.0			
Total	**3,333.0**	**2,497.3**		....	**268.5**	**12.9**	**193.1**	**56.4**	**2,377.6**	**735.6**	**1,673.9**

ABU DHABI

Abu Dhabi Gas Industries Ltd.—											
*Asab NGL extract, Western Region	306.0	180.0	2-7								
*Bu Hasa NGL extract, Western Region	396.0	284.0	2-7								
Ruwais NGL			†								
Abu Dhabi Gas Liquefaction Co. Ltd.—Zakum, Umm Shaif, Bunduq, Das Island	450.0	465.0	1-3-4 5-6								
Abu Dhabi National Oil Co.—Habshan, Thamama C onshore area	450.0	340.0	[7]1							546.0	
Total	**1,802.0**	**1,269.0**		.....	.....	.....	.....	.....	.....	**546.0**	.....

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†Fractionation: 22,000 tons/day NGL capacity

ALGERIA

Sonatrach—Camel plant, Arzew	NR	170.0	4-7					218.6			
Hassi R'Mel, Laghouat, Module 0	NR	1,578.0	NR								[11]2,309.0
Hassi R'Mel, Laghouat, Module 1	NR	2,085.2	6								[11]3,140.2
Skikda	NR	435.0	4-7					414.2			
Total	**5,335.2**	**4,268.2**		.....	.....	.....	.....	**832.8**	.....	.....	**5,449.2**

ARGENTINA

Cogasco SA—*Loma de la Lata, Neuquén	211.8	218.9	[23]5-7		50.3		36.4			79.2	
Gas del Estado—*Cañadón Alfa, Tierra del Fuego	52.9	74.6	[13]1-3							14.6	
*Cañadón Piedras, Tierra del Fuego	52.9	45.2	[13]1-3							7.3	
*Cañadón Seco, Caleta Olivia, Santa Cruz	17.6	17.6	[13]1-[16]2		2.8		4.3			4.9	
*Caimancito, Ledesma, Jujuy	35.3	53.0	[13]1-[16]2		5.0		7.5			6.7	
*Centenario, Neuquén	17.6	17.6	[13]1-[16]2-4		4.2		4.8			7.2	
Chimen Aike, Rio Gallegos, Santa Cruz	28.2	28.2	[35]1-3							160.1	
El Huemul, Pico Truncado, Santa Cruz	97.1	28.2	[35]1-4								
*El Medanito, Colonia Catriel, Neuquen	45.9	21.2	[35]1-3-4							7.8	
*General Cerri, Buenos Aires	635.6	688.5	4-[23]5-7	694.9	343.5		214.0			100.4	
Plaza Huincul, Cutral, Neuquén	17.6	14.1	4-[31]5								
*Rio Neuquén, Neuquén	105.9	97.4	4-[31]5							37.1	
Sierra Barrosa, Neuquén	26.4	17.6	4-[31]5								
Total	**1,344.8**	**1,322.1**		**694.9**	**406.8**	.....	**267.0**	.....	.....	**425.3**	.....

Company, plant, location	MMcfd			Production—1,000 gpd (Average based on the past 12 months)							
	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
AUSTRALIA											
Esso Australia Ltd.—											
Gippsland No. 1, Longford, Victoria	370.0	170.0	[19]2	93.0	147.0		83.0			182.0	....
Gippsland No. 2, Longford, Victoria	367.0	170.0	7	93.0	147.0	....	83.0			182.0	
Gippsland No. 3, Longford, Victoria	370.0	170.0	7	93.0	147.0		83.0			182.0	
Santos Ltd.—Moomba, Cooper Basin	666.0	466.0	[14]1-[23]5-7				....	610.3		512.5	....
Woodside Offshore Petroleum PL—											
Withnell Bay, Burrup Peninsula, Karratha, n of w Australia	800.0	400.0	7								[11]850.0
Total	2,573.0	1,376.0		279.0	441.0	....	249.0	610.3	....	1,058.5	850.0
AUSTRIA											
OeMV AG—Aderklaa, Lower Austria	17.5	13.7	7	....	....	....	....	26.7	....	28.4	....
BAHRAIN											
Bahrain National Gas Co.—Jebel Al-Dukhan	168.0	155.0	[19]2	....	115.0	....	100.0	....	....	152.0	....
BANGLADESH											
Bakhrabad Gas Systems Ltd.—											
*Muradnagar Upazilla-1, Comilla District	60.0	58.0	[35]1								
*Muradnagar Upazilla-2, Comilla District	180.0	120.0	[31,32]5								[11]8.2
Total	240.0	178.0		....	....	....	....	....	....	....	8.2
BOLIVIA											
Yacimientos Petroleos Fiscales Bolivanos—											
Colpa plant, Andres Ibanez Province, Santa Cruz	192.0	18.0	[13]1					7.8		5.7	[11]11.0
*Rio Grande plant, Cordillera Province, Santa Cruz	282.0	159.3	[13]1		1.4	2.5		153.9		55.8	[11]125.9
Total	474.0	177.3		....	1.4	2.5	....	161.7	....	61.5	136.9
BRAZIL											
Petrobrás—											
Asfor, Ceará	12.0	8.1	[47]2					20.3		4.0	
Atalata, Sergipe	70.0	88.0	[47]2					146.4		47.3	
Cabiúnas, Rio de Janeiro	19.5	16.6	[47]2					41.5		4.8	
Cabiúnas, Rio de Janeiro			18					18.3		21.4	
Candeias, Bahia	70.0	84.7	[47]2						146.4		
Catu, Agua Grande, Bahia	50.0	64.0	[47]2						93.0		[2]2.1
Guamaré, Rio Grande do Norte	70.6	45.0	[47]2					163.8		25.6	
Lagoa Parda, Espirito Santo	5.7	5.3	3					6.6		2.6	
Rio de Janeiro I	70.0	58.0	[47]2					130.0		21.7	[11]8.5
Rio de Janeiro II	70.0	45.0	7	6.1				92.0		15.1	[11]38.8
Total	437.8	414.7		6.1	....	....	....	618.9	239.4	142.5	49.4

†396,000 g/d condensate capacity, 77,000 g/d condensate throughput.

Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
BRUNEI											
Brunei Shell Petroleum Co. Sdn. Bhd.—Seria	82.0	67.4	4	....		....	....	....	....	....	
Brunei LNG Sendirian Berhad—Lumut	950.0	765.0	6		9.4				50.1	252.1	
Total	1,032.0	832.4		....	9.4	....	....	....	50.1	252.1	....

Canada

Alberta

Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Alberta Natural Gas Co. Ltd.—											
*Cochrane, ne¼, 16-26-4 5w5m	1,300.0	1,300.0	6-7	1,715.0					655.0		
Altana Exploration Co.—											
Caroline, 12-36-34-6-w5m	13.0	5.0	[19]2						8.9		
Monitor, 10-3-35-4-w4m	9.0	3.5	4								
Niton, 10-16-55-13-w5m	5.0	1.0	3						0.8	1.6	
Saddle Lake, 16-26-57-13-w4m	5.0	1.1	4								
Altex Resources Ltd.—											
Delburne, LSD 10-8-37-23 w4m	18.0	5.8	3-4						5.1		
Penhold, LSD 10-30-36-27 w4m	6.5	4.6	3-4						4.0		
Amocu Canada Petroleum Co. Ltd.—											
Ante Creek-1, nw 18-65-23 w5m	10.0	1.3	[19]1-3-4						9.6		
Ante Creek 4-13, LSD 4 13-65-24 w5m	2.0	0.8	3							0.1	
Ante Creek Dunvegan-3, LSD 10 4-66-23 w4m	10.0	2.2	3						1.7		
Arrowwood North, 4-15-21-25 w4m	7.9	2.1	4								
Arrowwood South, Hussar, 1-7-20-25 w4m	24.9	4.1	4								
Athabasca East, 9-23-66-22 w4m	9.0	4.2	4								
Atlee-Buffalo, 12-21-20-8 w4m	4.0	0.7	4								
Baptiste (Athabaska N.),5-18-67-22w4m	11.3	2.1	[7]1-4								
Baptiste, 8-18-68-23 w4	4.0	0.8	[21]1								
Big Bend, 2-7-67-26 w4	10.0	2.3	3								
Bigoray (Pekisko), 6-28-51-8 w5m	13.2	5.5	[21]1-3							1.6	
*Bigoray 13-9, 13-9-52-8 w5m	1.7		3						9.7		
Bigstone D-3, sw¼ 10-61-22 w5m	55.7	32.0	[33]1-3-4								
Bigstone Dunvegan, se 10-61-22 w5m	18.0	17.8	3-4						35.2		
Bolloque, 16-23-64-26 w4m	10.0	2.3	4								
Bouvier, 15-29-70-24 w4m	5.2	0.8	[21]1-4								
Braeburn, 16-19-77-10 w6m	5.6		[7]1-4								

Company, plant, location	MMcfd Gas capacity	Gas through-put	Process/ condition method	Production—1,000 gpd (Average based on the past 12 months) Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Brazeau (Elk River), 4-6-47-12 w5m	7.0	1.7	$^{7-13}$1-3-4						0.3		
Brazeau River, 1-46-14 w5m	218.2	83.5	^{7}1-3						41.0		
Cache, 1-32-59-13 w4m	15.0	6.5	^{13}1-4								
Caroline North, 1-11-35-6 w5m	74.3	40.9	$^{13-20}$1-3		22.4	21.1				35.1	
Caroline South, 3-20-34-4 w5m	47.7	26.2	$^{7-13}$1-2		14.9	16.9				28.0	
Cessford, 2-8-24-12 w4m	128.0	23.6	3-4							3.2	
Cherhill, 4-24-56-5 w5m	7.0	5.3	^{7}1-2						6.5		
Craigend, 16-1-64-13 w4m	5.0	2.5	4								
Cranberry, 1-24-96-5 w6m	88.3	43.1	$^{7-13}$1-3-4						40.5	59.7	
Duvernay, 11-11-55-12 w4m	14.6	3.0	4								
Eaglesham, 2-14-77-25 w5	4.0	1.9	$^{7-13}$2-3						1.6		
D-1, East Crossfield, n½ 14-28-1 w5m	105.9	48.9	^{33}1-3-4						3.4	12.3	
East Crossfield, ne¼ 14-28-1 w5m	45.0		3-4								
Edson, 3&4 11-53-18 w5m	372.5	125.0	$^{7-13}$1-3-4							47.6	
Edwand, 7-12-62-17 w4m	2.5	0.5	4								
Ellerslie, sw¼-4-52-25 w4m	315.0	155.6	3-4 ^{23}5-7	459.1	212.7	78.7				37.5	
Empress I & II, sw¼ 12-20-1 w4m	3,500.0	2,800.0	3-4 ^{23}5-7	1,962.5	745.8	283.4				119.9	
Enchant, 11-9-14-16 w4m	7.0	6.0	4								
Fir, ne¼ 32-58-21 w5m	60.0		^{13}1								
Flat Lake, 11-17-67-18 w4m	6.5	1.1	4								
Frenman, 11-21-64-9 w4m	8.0	4.6	^{13}1-4								
Garrington, 11-17-34-3 w5m	15.0	5.2	^{13}1-3-4		10.6	5.8			2.5		
Gilby North, 9-12-41-4 w5m	4.2	1.2	^{13}1-3-4							0.7	
Gilby South, 8-26-40-3 w5m	6.4	4.6	4-^{8}5							2.1	
Granada, Pembina, LSD 2 18-52-11 w5m	30.0	17.0	3						25.8	0.3	
Haight Mundare, 6-8-53-16 w4m	7.0	1.7	4								
Hilda, 16-22-17-2 w4m	6.0	2.7	4								
Hollow, 10-22-61-20 w4m	10.0	2.7	4								
Hotchkiss East, 6-6-94-1w6	12.7	1.5	^{13}1-4								
Hotchkiss MD, 11-29-94-25 w5m	191.1	8.1	4								
Hotchkiss North, 2-35-94-2 w6m	22.6	13.4	^{33}1-4								
Hotchkiss South, 9-34-93-01 w6m	22.1	3.3	4								
Hylo, 12-65-15 w4m	3.3	1.5	^{13}1-4								
Inland, 4-25-51-15 w4m	7.5	2.2	^{13}1-3-4							10.8	
Inland South, 15-31-50-14 w4m	9.0	1.6	4								
Jenner, 10-34-19-9 w4m	14.0	7.5	$^{7-13}$1-3-4							1.5	
Josephine, ne¼ 1-83-10 w6m	50.0	8.7	3							5.0	
*Kaybob South 1, 1-12-62-20 w5m	225.6	81.6	$^{7-13}$1-3-4		118.3	74.5				162.8	
*Kaybob South 2, 3&4 12-62-20 w5m	169.1	24.5	^{7}1-3-4						91.6	118.4	
Kaybob South (West Fox Creek), 13-22-60-19 w5m	15.7	5.6	3						3.2		
Kirby, nw 25-73-5 w4m	53.0	33.2	^{13}1-4								
Kirby Lake, 12-8-74-5 w5m	44.8	29.2	4								
Lanaway, 13-5-36-4 w5m	15.0		^{13}1-4								
Lavoy, 11-12-52-14 w4m	15.9	4.7	4								
Leaman, 4-10-56-11 w5	17.7	7.1	3						5.7	2.4	
Leismer, 21 77-8 w5m	27.0	27.2	^{13}1-4								
Little Bow, 16-13-14-18 w4m	20.0	5.3	$^{7-13}$1-3-4							0.6	
Lobstick, sw¼ 17-50-7 w5m	44.1	32.2	3-4						28.7	1.1	
Lone Pine Creek, 6-23-30-28 w4m	74.0	15.4	^{7}1-3-4							24.4	
Majorville, 4-31-18-19 w4	10.8	8.9	3							1.9	
Mannville, 3-27-50-9 w4m	33.9	11.5	4								
Markerville, 10-6-36-2 w5m	15.0		^{13}1								
Marten Hills, 18-76-25 w4m	142.3	31.9	4-^{23}5								
Meanook, 6-10-63-22 w4m	26.5	3.7	^{13}1-4								
Medicine Hat, 2-27-15-4 w4m	12.0	4.3	4								
Medicine Hat North, 1-7-16-2 w4m	4.5	2.2	1-4								
Medicine River, 6-16-38-4 w5m	6.5	4.0	3-4		0.5	1.2				1.6	
*Nipisi, 4 11-80-8 w5m	44.1	0.4	^{20}1-3 ^{23}4-5						158.1	0.6	
Nipisi (Mitsue), 12-30-72-4w5	25.0		3-4-6								
Oyen, 14-36-28-5 w4	4.0	0.6	3-4								
Patricia, 13-5-21-12 w4m	7.9	1.5	4								
Pembalta 1, ne¼ 25-48-7 w5m	8.2	4.8	3-4								
Pembalta 2, e½ 15-47-7 w5m	16.0	10.4	3-4								
Pembalta 7, sw¼ 34-47-9 w5m	13.7	6.6	3-4								
Pembalta 8, sw¼ 5-49-9 w5m	10.9	2.5	3-4								
Pembina, 10-25-45-9 w5	1.0	0.6	3						0.5		
Pembina (Keystone), 6-15-48-3 w5m	7.5	4.1	3-4		2.6	3.4				3.1	
Pouce Coupe, 11-19-79-11 w6	11.7	8.8	3							6.0	
Provost, 13-9-33-8 w4	1.7	0.5	3								
Provost, ne¼-19-36-5 w4m	80.0	22.8	5								
Provost (Amisk), 1-22-41-8-w4m	10.0	1.2	3-4 $^{7-13}$5							<0.1	
Provost (Brownfield), se¼-2-39-12 w4m	10.6	11.5	3-4-^{8}5							1.2	
*Provost (Castor East), 4-3-38-13 w4m	19.9	6.3	4-^{8}5							0.4	
Provost (Choice), 13-17-40-9 w4m	10.0	1.6	4-5							0.1	
Provost (Consort), 8-19-36-5 w4m	75.8	21.3	^{13}1-4							3.7	
Provost East, 3-30-37-2 w4m	9.5	4.0	3							0.6	
Provost (Monitor), 2-3-35-5 w4m	6.5	0.5	3-4								
Ranfurly, 14-32-50 12 w4m	15.9	15.9	4								
Richdale, 7-9-12 w4m	10.0	4.0	3-4							0.4	
*Ricinus, 11-30-35-8 w5m	22.2	39.6	3-4 ^{23}5-7		96.0	53.0				61.1	
Route, 7-16-62-8 w6m	70.0	12.5	^{13}2-4						7.0		
Sinclair, sw 19-72-11 w6m	70.0	32.8	^{13}1-3-4							9.8	
St. Albert, 14 36-53-26 w4m	2.0	0.1	$^{7-13}$1-3-4						1.5		
South Wapiti, ne 36-67 9 w6m	298.4	188.3	$^{8-32}$5							39.3	
Steele, 10-19-77-24 w4m	8.9	2.3	$^{13-23}$1-5								
Sturgeon Lake South, se 2-69-22 w5m	22.8	11.2	^{33}1-3-4						8.5	13.3	
Sundance, 6-25-54-21 w5m	15.6	15.1	3							9.8	
Sundance, 7-9-54-21 w5	6.0	2.3	3-^{15}5							<0.1	
Sylvan Lake, 10-12-38-3 w5m	4.0	1.4	3		0.3	0.4				0.6	

Company, plant, location	MMcfd Gas capacity	Gas throughput	Process/ condition method	Production—1,000 gpd (Average based on the past 12 months) Ethane	Prop.	Isobut.	Normal or unspilt butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Sylvan Lake, 14-32-37-3 w5m	54.0	26.4	[7]1-3		23.2	1.6				11.2	
Tangent, 16-20-80-24 w5m	7.5	2.7	[7]1-3-4								
Three Hills Creek, nw½ 13-35-26 w4m	12.0	3.6	3-4						6.1		
Tower North, 6-14-76-16 w4m	7.0	4.3	4								
Twining, sw 31-32-24 w4m	8.3	4.5	3							5.1	
Valhalla, 1-29-75-9 w6m	31.8	21.2	3-4							3.3	
Vulcan, se¼-24-15-22 w4m	55.2	30.6	[21]1-[7,33]2 3-4							7.3	
Wandering River, 9-30-72-14 w4m	11.9	1.9	4								
Warwick, 10-18-53-14 w4m	8.4	2.1	4								
Waskahigan, ne7-64-23 w5m	16.3	10.8	[13]1-3-4						7.7		
Wembley, 6-19-73-8 w6	99.0	22.9	[7]1-3 4-7						57.4	129.6	
Whitelaw, 13-20-81-1 w6m	10.0	0.6	4								
*Willesden Green, 27-42-8 w5m	40.0	21.6	3-7		12.9	12.7				8.9	
*Windfall, 8-17-60-15 w5m	421.6	84.0	[7]1-3-4							66.4	
Worsley, 7-22-87-7 w6m	56.7	0.5	[19]1-3							0.6	
Zama, nw 12-116-6 w6m	25.6	8.4	[7,13]1-2-4						8.2	8.0	
Anderson Exploration Ltd.—											
Belloy, 16-3-78-1 w6m	9.0	8.5	4-[28]5							1.0	
Bruce, 10-1-48-15 w4m	3.0	2.0	4								
Buff Coulee, 11-12-47-7 w4m	8.0	7.5	4								
Dunvegan, 15-3-81-4 w6m	240.0	125.0	3-4-7						85.0	38.0	
Hines, LSD 6-35-85-3 w6m	8.0	7.5	4-[28]5								
Dixonville, 8-14-85-25 w4m	4.0	2.6	4								
Kitscoty, 10-17-51-3	2.0		4								
Lloydminster, 7-11-51-1 w4m	2.0	1.5	4								
Manyberries, 10-1-5-5 w4m	2.5	1.8	4								
Mirage, 10-2-79-8 w4m	1.5	0.2	3-4							0.2	
Paradise, Omega, 8-24-46-02 w4m	5.0	3.8	4								
Woking, 11-30-75-4 w6m	4.5	1.8	3-4								
Ausquacan Energy Ltd.—Bantry, LSD 4 33-17-12 w4m	12.4	5.5	2	<0.1	0.3		0.8			2.7	
Bumper Development Corp. Ltd.—Bumper Crystal, Wetaskiwin, 16-36-45-4 w5m	4.0	1.5	3						3.0		
Bumper Rose Creek, Wetaskiwin, 8-13-45-7 w5m	5.0	3.5	[17]5								
Canadian Hunter Exploration Ltd.—											
Basset Station 1, ne¼ 29-104-2 w6m	7.0	3.6	[17]5							0.1	
Basset Lake South, ne¼ 29-106-5 w6m	4.0	2.7	3							0.1	
Elmworth Deep Cut, se¼ 8-70-11 w6m	275.0	155.0	7					233.0			
Elmworth Shallow Cut, se¼ 8-70-11 w6m	300.0	190.0	[11]5							21.5	
Haig River, nw¼ 33-104-5 w6m	5.4	2.3	3							0.1	
Karr, nw¼ 10-65-2 w6m	50.0	31.0	3		8.2		9.5			26.2	
South Gold Creek, nw¼ 15-66-5 w6m	15.0	1.9	[35]1							0.6	
Canadian Occidental Petroleum Ltd.—											
Carrot Creek, 2-26-52 12 w5m	14.0	9.0	3					[5]15.2			
Keystone, 5 35-46-4 w5m	10.0	4.0	2		1.8		1.8			1.9	
Mazeppa, se¼ 35-19-28 w4m	42.4	17.7	[13]2								[11]17.4
Paddle River, LSD 13, 6-57n-8 w5m	—	—	[7]1-7	10.9	16.9		9.5			7.3	
Petrogas Processing, Crossfield, s½ 2-26-29 w4m	210.0	74.0	[7]1		34.3		24.3			44.9	
Chevron Canada Resources—											
*Bigoray, 10-7-51-9 w5m	3.0	NR	[7]1-3-4								
*Brazeau, 16-35-48-12 w5m	24.8	15.8	3-4 [23]5-7						31.7		[5]69.8
Chinchaga, 5-32-98-7 w6m	30.0	10.3	[5,13]1-4								
Ferrybank, 14-11-45-27 w4m	5.2	4.1	3-4						3.2		
Joffre, 14-36-38-27 w4m	9.0	3.6	3-4						4.3		
*Kaybob South No. 3, 15-59-18 w5m	445.0	289.0	[7]1-[13]2-4 [13]5-7					83.2		264.9	[5]388.8
*Mitsue, 11 30-72-4 w5m	30.0	1.2	[13]2-4						553.6		
North Gilby, 1-24-41-3 w5m	23.0	12.1	3-[32]5					11.6			
Pouce Coupe, 6-30-79-11 w6m	19.9	10.9	3-4					9.2			
Princess, 12-12-20-12 w4m	13.0	4.5	[7]1-[32]5							0.8	
Sylvan Lake, 1-21-38-2 w5m	31.5	16.4	[13]2		14.5		10.8			8.9	
*West Pembina, 11-22-49-12 w5m	32.0	16.5	[7]1-3-4					34.7		22.8	
Chieftain Development Co. Ltd.—											
Chisholm, 11-2-69 1 w5m	4.0	4.0	[35]1								
Craigend, 9-25-64 14 w4m	9.0	9.0	[35]1								
Hythe-Brainard, 14-18-74 12 w6m	130.0	100.0	[13]5-6							0.2	
Island Lake, 10-21-67 24 w4m	4.0	4.0	[35]1								
Keg River, 7-12-103 24 w5m	21.0	20.0	[35]1								
Tweedie, 11-5-68 12 w4m	11.0	11.0	[35]1								
Cooperative Energy Development Corp.—											
Blackie, 06-15-20-27 w4m	4.0	1.0	[13,28]2-4						1.0		
Carrot Creek, LSD 10-16-53-13 w5m	8.0	6.0	[13,28]2-4						8.0		
Edson 1-13, LSD 1-13-54-19 w5m	10.0	6.0	[13,28]2-4						9.0		
Edson North, LSD 16-15-53-18 w5m	8.0	4.5	[13,28]2-4						5.6		
Edson South, 10-30-52-17 w5m	1.5	1.0	[13,28]2-4						1.5		
Iosegun 4-15, LSD 4-15-65 20 w5m	6.0	4.0	[13]1								
Iosegun 10-23, LSD 10-23-65-20 w5m	10.0	8.0	[13]1								
Iosegun 10-27, LSD 10-27-65-20 w5m	6.0	4.0	[13]1								
Medicine River, LSD 10-14-39-3 w5m	6.0	6.0	[13,28]2-4						2.5		
DeKalb Petroleum Corp.—											
Blueberry Mountain, 11-16-82-7 w6m	10.0	5.0	5							1.5	
Bingley, 2-36-40-7 w5m	2.6	2.6	6						4.0		
Garrington, 13-5-34-3 w5m	12.0	5.0	7						6.5		
Leafland, 15-31-39-5 w5m	23.5	10.0	7						13.0	13.0	
Nevis, 12-7-41-22 w4m	27.0	10.0	[13]1								
Enron Oil Canada Ltd.—											
Greencourt East/Thunder, 9-20-59-6 w5m	7.0	5.6	3					2.4			
Highvale, 10-4-51-4 w5m	8.0	5.7	3					2.4			[11]0.5
Esso Resources Canada Ltd.—Big Bend, 13-36-66-27 w4m	35.0	12.0	[7,13]1-3								

	MMcfd			Production—1,000 gpd (Average based on the past 12 months)							
Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Boundary Lake South, Floral, 1-14-85-13 w6m	17.0	3.1	4							0.8	
Castor, 4-3-38-13 w4m	1.5	0.9	[13]1-6						3.8		
Comet Galaxy, Rainbow Lake, 12-23-110-7 w6m	8.0	5.8	3								
Countess, 8-36-20-16 w4m	4.5	0.7	[13]1								
*Devon—1 and 2, 34-50-26 w4m			†		(138.7)		(89.8)			(69.4)	
Euerdell, Ferrier 14-20-38-7 w5m	10.0	3.8	3-4		3.5		2.2			1.1	
Golden Spike, 16-22-51-27 w4m	126.0	126.0	4		20.3		13.6			10.1	
Hornbeck, 16-7-54-19 w5	20.1	19.9	3								
Irish, 16-36-54-6 w4m	15.0	5.0	[11]1								
Joarcam, 11-3-49-21 w4	7.6	7.3	3-4								
Joffre D2, Lacombe, ne¼ 17-39-26 w4m	7.5	3.0	3-4		2.8		1.7			0.5	
Judy Creek, 10-25-64-11 w5m	265.0	153.6	1-2-3 4-5-7						723.4		
Leduc, Devon, 34-50-26 w4m	35.0	29.2	3		17.2		18.2			9.1	
Medicine Hat-Roseglen, 4-1-16-3 w4m	20.0	7.8	[11]1								
Niton, LSD 14-18-54-12 w5m	50.0	30.7	3		3.8		3.8			5.1	
Quirk Creek, s½ 4-21-4 w5m	90.0	33.3	2		14.4		10.7			13.8	
Redwater, LSD 8 29-57-21 w4m	22.1	10.2	2		23.0		18.1			11.1	
Sundance, 4-36-54-21 w5	15.5	15.0	3								
Wapiti, 4-8-69-8 w6m	125.0	78.5	3-4							9.6	
Wapiti Deep Cut, 4-8-69-8 w6m	320.0	124.0	3-4 [21]5-6-7					217.0			
Gulf Canada Corp.—											
Baptiste, LSD 5-28-67-22 w5m	10.4	3.9	[17]5								
Blood Magrath, 7-8-6-22 w4m	11.5	4.8	3						0.6		
Buffalo Lake North, LSD 11-24-41-21 w4m	7.1	1.2	3							0.1	
Hanna, LSD 2-36-31-14 w4m	3.0	0.6	3-4							0.1	
Hanlan-Robb, ne¼ 2-49-20 w5m	304.0	169.8	[9]2							5.1	
Island Lake, 1-18-68-23 w4m	5.2	1.1	[23]1-4								
Morrin-Ghost Pine, LSD 1, 8-11-31-21 w4m	109.4	54.4	3							0.4	
Nevis, ne¼ 9-33-38-22 w4m	125.0	59.2	[21,23]2-4		67.5	51.3				45.6	
Rimbey, LSD s½ 5-44-1 w5m	421.0	234.4	[23]2		263.8	151.7				187.2	
Strachan, LSD 11-35-37-9 w5m	275.0	146.1	7						128.1	150.3	
Swalwell, LSD 6-33-29-24 w5m	4.0	1.0	5						0.3		
West Drumheller, 12-1-30-21 w4m	3.4	NR	[23]1							1.1	
Home Oil Co. Ltd.—Bashaw, 8-10-42-22 w4m	11.9	4.0	5								[11]0.1
*Carstairs-Crossfield, 3-3-30-2 w5m	280.0	100.0	2		67.2		48.3			100.8	[11]8.0
Cossack, 7-17-60-17 w4m	6.0	0.2	[13]1-4								
Leismer, 6, 7-77-7 w4m	40.0	29.5	[13]1-4								
Marten Hills South-1, 14-22-74-24 w4m	21.0	9.7	[13]1-4-[15]5								
Marten Hills South-2, 14-29-74-25 w4m	8.0	0.8	[13]1-4								
Retlaw, 12-2-13-19 w4m	10.0	3.6	5							0.4	
South Elkton, 2-3-31-4 w5m	8.0	4.8	3							3.0	
Tieland, 5-14-67-2 w5m	10.0	3.1	[13]1-4-[35]5								
Husky Oil Operations Ltd.—											
Baxter Lake, 11-22-46-5 w4m	0.6	0.4	[35]1-4								
Buffalo Coulee, 7-24-46-7 w4m	4.2	4.0	4								
Cessford, Special Area 3, LSD 4-6-24-10 w4m	13.5	5.7	4-[31]5								
Consort (Provost), 7-34-34-6 w4m	10.0	1.6	[31]1-3-4								[11]0.5
Eagle Wildmere, 29-48-6 w4m	5.7	3.4	[35]1-4								
Entice, se 24-28-24 w4m	6.0	4.6	[31]1-4								[11]0.1
Ghost Pine, 10-4-32-23 w4m	2.4	1.2	3-4								[11]1.5
Halkirk, 2-34-38-16 w4m	5.0	2.1	3								[11]1.8
Killam, 10-27-42-13 w4m	5.0	1.2	[21]1-4 [31]5								
Kitscoty, 18-50-2 w4m	0.8	0.5	[35]1-4								
Kitscoty South, 7-23-49-3 w4m	2.6	2.1	[35]1-4								
Hussar, 13-36-24-21 w4m	84.0	19.8	[1]2-4		15.4		15.8				[11]7.0
Judy Creek, 8-24-63-10 w5m	4.5	1.2	3-4								[11]0.3
Leahurst, 15-18-40-18 w4m	10.0	0.7	[32]5								[11]0.3
Mannville, 32-52-7 w4m	3.4	2.3	[35]1-4								
Nordegg River (Brazeau R), w½ 10-44-12 w5m	55.0	16.0	[7]1-[32]5								[11]15.8
North Oyen, 11-17-29 w4m	4.0	1.1	[31]1-4								
North Wainwright, 16-15-46-6 w4m	8.5	7.0	[35]1-4								
Okotoks, MD 31, Foothills, sw¼ 27-20-29 w4m	34.8	30.4	[21]1-[31]5								[11]3.8
Rainbow Lake, 10-10-109-8 w6m	104.0	95.7	[7]1-3-4					638.3			
Ram River, 2-37-10 w5m	630.0	385.0	[7]1-[32]5								[11]32.1
Rivercourse, 8-47-1 w4m	2.8	1.9	[35]1-4								
Sinclair, 2-14-72-12 w6m	10.0	5.0	3						5.0		
Vermilion South, 5-48-6 w4m	3.1	2.1	[35]1-4								
Veteran (Provost), 15-29-34-8 w4m	7.0	3.4	[31]1-3-4								[11]1.3
Wayne Rosedale, 12-4-28-20 w4m	15.0	1.2	[31]1-3-4						1.6		[11]1.0
Wildmere, 19-47-4 w4m	2.6	1.7	[35]1-4								
Wimborne, 16-5-35-26 w4m	3.8	1.0	3-4								
ICG Resources Ltd.—											
Acheson, sw¼ 2-53-26 w4m	7.5	7.5	3		27.0		14.0			8.6	
Chard, 16-1-79-5-w4m	5.3	5.3	4								
Cowpor, 11-19-80-4w4m	12.0	7.0	4								
Gilby, 10-10-041-03-w5m	12.0	6.0	[28]5						1.7		
Hilda, 4-26-17-2 w4m	5.5	2.0	4								
Leafland, 13-16-040-05 w4m	5.5	5.5	6					8.0			
Many Islands, 4-16-14-1 w4m	28.0	20.0	4								
Tweedie, se½ 19-68-12 w4m	15.0	7.5	4								
Jordan Petroleum Ltd.—Three Hills, LSD 11-16-31-23 w4m	5.0	1.5	2						0.6		
Kerr-McGee Corp.—											
Craigmyle, 13-5-32-17 w4m	6.2	6.2	[28]3						2.2	2.0	
Elnora, 5-19-35-22 w4m	18.0	15.0	[3]3						4.2		
Ferrybank, 3-31-44-27 w4m	8.5	8.5	[28]3							0.5	

Company, plant, location	MMcfd Gas capacity	Gas through-put	Process/condition method	Production—1,000 gpd (Average based on the past 12 months) Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Rich, 16-22-35-21 w4m	3.0	2.0	^{26}3							0.5	
Mid-West Gas Transmission Co. Ltd.—											
Fort Saskatchewan, se¼ 3-55-22 w4m	35.0	34.3	7						63.2		
St. Albert, Sturgeon Dist., se¼ 3-26-54-25 w4m	20.0	13.8	^{19}2		5.6	3.7				2.4	
Mobil Oil Canada Ltd.—											
Bluesky, Bluesky field, 6-6-109-6w6	7.0	2.0	^{35}1-4								
*Carson Creek, 4 23-61-12 w5m	86.5	65.0	^{19,20}2		24.0		37.0			47.0	
*Duhamel, 3 32-46-21 w4m	3.7	0.9	^{7}2					2.1		4.0	
Harmattan East, 9-27-31-4w4	490.8	270.0	^{7,19}2		120.0		85.0			165.0	
Harmattan Elkton (D3), 10-27-31-4 w5m	33.6	8.2	^{33}1								
Liege, 1-16-92-21 w4m	30.0	15.0	^{35}1-4								
Lone Pine Creek South, 6-27-29-28 w4m	35.0	15.1	^{7}2								
Pembina (Station 4), 16-49-8w5	10.9	8.5	^{28}2							7.7	
Rainbow Battery No. 10, 10-110-6w6	33.0	28.0	^{7,35}2						14.0		
Teepee Creek, Grande Prairie, LSD 7-2-74-4 w6m	19.5	9.0	^{7}2							2.6	
Three Hills, 4 33-31-23 w4m	30.0	12.2	3					13.0		4.5	
Twining, 16-20-31-24w4	1.7	1.0	^{15}1							0.1	
Willesden Green, 8 29-40-6-5 w5m	3.2	1.9	3					2.5		<0.1	
Wimborne, 4 12-34-26 w4m	34.8	18.4	^{7}2							11.0	
Wintering Hills, 16 7-24-16 w4m	6.0	1.1	3							0.1	
Murphy Oil Co. Ltd.—Glendon, Sugden-Grand Rapids, 03-16-61-8 w4m	11.0	0.8	4								
Princess No. 1, 14-23-19-10 w4m	7.5	4.0	^{13}4								
Princess No. 2, 08-16-20-10 w4m	7.5	4.0	^{13}4								
Norcen Energy Resources Ltd.—											
Bigoray, Parkland 31, 10-22-51-8 w5m	3.0	1.3	3-4						15.7		
Boyer, 1-17-105 1 w6m	18.0	13.0	4-^{8}5						137.1		
Bruce, Beaver 9, 2-6-47-15 w4m	30.0	5.5	^{13}1-4								
Ferrier, Radial Lake, se¼ 2-34-40-9 w5m	20.6	6.8	3						238.0		
Gilby, Lacombe, 10-8-41-1 w5m	2.6	1.3	^{13}2-4								
Judy Creek, 12-19-64-1 w5m	2.0	1.0	1-^{8}5							340.0	
Kessler, 14-5-39-8 w4m	5.6	1.7	3-4								
McLeod, 16-17-55 14 w5m	3.2	2.0	3-4						35.0		
McLeod River, Dist. 14, 7-34-54-14 w5m	5.2	3.3	3-4						96.0		
Minnehik-Buck Lake, 10-5-46-6 w5m	108.0	70.0	^{7}1 ^{32}5-7						43.4	32.6	
Netook-Olds, Mountain View 17, 16-21-33-1 w5m	1.9	1.6	^{13}1-4								
Provost-Bodo, Provost 52, ne¼ 16-31-37-2 w4m	5.0	1.0	^{13}1-3-4							100.0	
Spirit River, 8-34-77 6 w6m	4.0	3.1	3						6.7		
North Canadian Oils Ltd.—											
Atlee Buffalo, 5-22-20-4 w4m	4.0	3.5	4								
Bantry, 5-8-19-13 w4m	18.0	12.0	4								
Beaverhill Lake, 4-17-52-18 w4m	3.0	2.5	1-4								
Bellshill Lake, 7-21-42-12 w4m	4.0	3.5	1-4								
Buffalo South, 4-22-20-5 w4m	4.0	3.5	4								
Canard, 9-30-57-8 w4m	12.0	12.0	4								
Conlac, Medicine Hat, 14-14-14-3 w4m	25.0	12.0	4								
Corbett Creek, 13-26-61-8 w5m	12.0	0.5	3-4								
Delia, 1-13-32-19 w4m	25.0	23.0	4								
Dinant, Bruce, 1-26-45-19 w4m	20.0	20.0	4								
Fenn Big Valley, 8-27-35-19 w4m	8.0	7.0	3-4				3.0				
Garden-Plains, 5-15-33-13 w4m	10.0	3.5	1-4								
Hilda, Medicine Hat, 9-34-18-2 w4m	7.0	3.5	4								
Hilda Schuler, 13-9-17-1 w4m	5.0	3.4	4								
Hilda West, 4-19-18-1 w4m	3.5	2.7	4								
Jarrow, 8-15-45-11 w4m	4.0	3.5	4								
Knopcik, 9-10-74-11 w6m	25.0	20.0	3-4						7.0		
Minburn, 8-24-51-10 w4m	7.0	7.0	4								
Morinville, 11-15-55-25 w4m	2.5	1.4	1-4								
North Mannville, 13-16-53-10 w4m	7.0	6.0	4								
North Plain Lake, 13-31-54-11 w4m	14.0	14.0	4								
Schuler, 1-28-16-1 w4m	3.5	2.5	4								
Sedgewick, 4-27-44-10 w4m	3.0	1.5	4								
Simonette, 7-6-63-26 w5m	2.0	1.0	4								
Sugden, 11-11-65-9 w4m	2.0	2.0	4								
Vale, Medicine Hat, 15-19-14-3 w4m	30.0	15.0	4								
Viking-Kinsella, 11-17-46-8 w4m	15.0	10.0	4								
Warwick, 8-34-52-14 w4m	4.0	1.5	4								
West Basset Lake, 7-14-108-7 w6m	6.0	0.5	3-4						1.5		
Westlock, 13-24-61-26 w4m	9.0	6.5	3-4								
Willingdon, 11-20-55-15 w4m	18.0	10.0	4								
NSM Resources Ltd.—											
Choice, 5 27-40-10 w4m	3.0	3.0	^{7}2							<0.1	
Redwater, Lamont, 15-16-56-20 w4m	1.0	0.1	3							<0.1	
Oakwood Petroleums Ltd.—Oakwood Grand Forks, 8-7-12-13 w4m	3.0	1.0	^{7}2-4					4.0			
Palmer Ranch (1984) Ltd.—Pincher Creek, s½ 23-4-29 w4m	12.0	6.0	3-4	1.0						4.5	
Paloma Petroleum Ltd.—											
Berry, 16-21-28-13 w4m	9.0	8.0	3-4								^{11}0.1
Compeer, 4-31-33 1 w4m	12.0	12.5	2-4								
Hotchkiss, LSD 7 13-94-3 w6m	6.0	2.5	1-4								
Kinsella, 12-36-49 13 w4m	5.0	3.5	3-4								
Lavory, 6-13-52-14 w4m	8.5	7.5	4								
Nestou, 11-23-60-24 w4m	4.5	1.0	4								
Snoky Lake, 7-9-59-17 w4m	2.5		4								
Viking, LSD 12 36-49-13 w4m	4.5	1.0	4								
PanCanadian Petroleum Ltd.—Alderson West, 10-28-15-15 w4m	23.5	3.1	3							12.9	^{11}<0.1
Alderson West, 6-2-16-15 w4m	6.0	1.9	^{7}1								
Bassano Lathom, 10-5-22-18 w4m	25.0	5.1	^{11}5								^{11}0.7

Company, plant, location	MMcfd Gas capacity	MMcfd Gas through-put	Process/ condition method	Production—1,000 gpd (Average based on the past 12 months) Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Carseland, 16-21-22-25 w4m	12.0	7.6	3								[11]<0.1
Countess 10-20-18-15 w4m	8.0	3.4	[7]2					3.4			[11]2.5
Countess Makepeace, 12-33-22-18 w4m	30.0	9.5	3								[11]2.0
Entice, 10-7-28-23 w4m	7.0	1.6	3								[11]<0.1
Ferrybank, 2-1-44-28 w4m	26.0	8.4	3								[11]4.5
Gilby Cantex Nortun, 6-21-40-2 w5m	2.1	0.8	3								[11]0.4
Halkirk, 03-36-37-17 w4m	3.0	0.9	3							¶3.7	
Hussar Crowfoot, 14-1-24-22 w4m	28.0	6.8	3					1.7			[11]2.1
Long Coulee, 6-30-15-21 w4m	8.2	3.5	[7]2								[11]0.8
Redland, 1-20-28-21 w4m	20.0	9.0	3		1.0		1.5				[11]2.8
Rycroft, 8-25-77-06 w6m	4.0	1.2	[7]2							¶2.1	
Tide Lake, 16-10-18-10 w4m	10.0	6.9	3								
Wayne Dalum, 5-17-27-19 w4m	19.0	3.4	[31]5								[11]0.6
Wintering Hills, 1-18-25-17 w4m	20.0	2.3	3								[11]0.8
Pembina Resources Ltd.—											
Breton, LSD 9-36-47-4 w5m	3.5	1.5	3					2.2			
Compeer, 6-36-33 2 w4m	5.0	1.8	[28]1								
Diamond Valley, 10-12-19-2 w5m	20.0	17.3	7	40.9	28.0		16.7			15.9	
Hotchkiss, North, LSD 3 35-94-2 w6m	16.0	7.7	[34]1								
Petro-Canada Inc.—											
Bellshill, Lake 3 28-41-12 w4m	3.0	2.7	[7]2						4.7		
*Brazeau River, 4-31-48-12 w5m	24.0	24.0	3						42.2		
*Brazeau River, sw¼ 31-48-12 w5m	27.5	23.8	[7]2						38.7	181.9	
Connorsville, 9 32-25-15 w4m	30.0	8.7	3-4							1.7	
Empress, ne¼ 11-20-1 w4m	2,400.0	882.8	[7]1-4-7	512.4	221.5	39.2	44.9			35.3	
Ferrier, 9 22-39-8 w5m	8.0	4.4	3-4						5.8		
Gilby No. 1064, Fina, 7 27-40-3 w5m	4.2	0.9	6						0.1		
Gilby No. 1130, 2 27-40-3 w5m	25.0	10.0	[7-13]2					5.4			
Gilby No. 1156, Medicine River, 5-40-3 w5m	28.0	13.7	[7-13]2					15.7		3.0	
Gold Creek, nw¼ 13 26-67-5 w6m	36.5	10.1	[7]2							23.1	
Greencourt, se¼ 9 26-59-9 w5m	37.0	10.0	[7]1-4-[31]5							1.7	
*Kaybob North, 8 9-64-19 w5m	131.0	58.5	[7]2-3-4						16.9	7.5	
Rainbow, 15 7-108-6 w6m	14.3	5.2	3-4								
Sedgewick, 2 16-42-12 w4m	6.0	1.8	[21]1								
Whitecourt, 12 26-59-11 w5m	68.0	34.0	[7]1-4-[31]5							6.4	
Wildcat Hills, sw¼ 6 16-26-5 w5m	110.0	54.9	[21]1-4-[8]5							19.7	
Phillips Petroleum Resources Ltd.—Gilby, LSD 6-36-40-3 w5m	2.7	1.5	6							0.7	
Sylvan Lake, 13-25-37-2 w5m	29.8	18.5	3						24.2	<0.1	
Placer Cego Petroleum Ltd.—											
Elnora, 13-14-34-22	4.0	3.5	[26]2						1.0		
Provost, 4-16-33-07 w4m	5.5	2.2	[26]2								[11]0.1
Sedalia, 9-29-31-05 w4m	8.0	6.9	[32]5								[11]0.1
Steveville, 2-31-22-11 w4m	2.0	3.0	[32]5								[11]0.2
Wood River, 16-08-43 2 w4m	5.0	1.0	[32]5								[11]0.2
Saratoga Processing Co. Ltd.—Coleman, 11-8-5 w5m	35.0	26.1	[21]1								
Sceptre Resources Ltd.—											
Cessford, 7-17-26-14 w4m	7.5	1.7	3								[11]0.3
Holmberg, nw¼ 13 14-44-17 w4m	11.5	8.8	[33]2								[11]0.3
Huxley, 6-17-34-24 w4m	12.5	4.1	[32]5								[11]0.9
Judy Creek, 1-21-63-11 w5m	3.0	0.3	4								[11]<0.1
Sorenson, 16-09-32-12 w4m	10.0	10.0	3-4					7.9			[11]0.5
Stanmore, 5-1-29-12 w4m	30.0	10.6	3								[11]1.5
Shell Canada Ltd.—											
Bonanza, 8-80-12 w6m	4.7	4.5	[13]1-6							3.4	
Burnt Timber 1 and 2, 13-30-7 w5m	127.0	91.8	[33]1-3							7.0	
Cranberry Lower Debolt, 4-20-96-3 w6m	14.0	9.1	[29]1-4								
Cranberry Slave Point, 4-20-96-3 w6m	17.0	14.0	3-4						13.4	16.7	
Gordondale, 24-79-11 w5m	9.3	2.8	[13]1-6							3.7	
*Hamburg, 12-29-96-11 w6m	65.3	35.0	[31]5							5.5	
Hope Creek, 17-64-13 w5m	5.4	3.5	[29]1-3							5.3	
House Mountain, 8-70-10 w5m	9.2	2.7	[29]1-3						25.0		
Jumping Pound, nw¼ 13-25-5-w5m, se¼ 23-25-5 w5m, sw¼ 24-25-5 w5m	200.0	158.0	[29]1-2-7	112.5	38.5		33.8			102.9	
Pouce Coupe, 8-80-12 w6m	3.3	0.8	[11]1-6							1.1	
Progress, 1-78-10 w6m	45.0	36.7	[13]2-4					26.4		29.0	
Simonette, 6-63-25 w5m	21.7	16.3	[29]1-3					15.8		9.2	
South Rosevear, ne 11-54-15 w5m	50.0	21.1	[29]1-3							6.8	
Waterton 1-2 and Straddle s½ 20-4-30 w4m, n½ 17-4-30 w4m, se¼ 24-4-1-w5m	315.0	151.8	[29]1-3-7	199.0	85.9		71.7			200.8	
Star Oil & Gas Ltd.—											
Grassland, 6-13-68-18 w4m	2.0	1.0	4								
Pouce Coupe, 11-34-79-12 w6m	10.0	6.0	3					4.0			
Redwater, 8-25-57-23 w4m	6.2	3.0	2-4								
Sunnybrook, Bell River Pool 15-22-48-2 w5m	5.0	2.5	3-4						0.5		
Sylvan Lake, Basal Quartz, Glauc., 16-19-38-1 w5m	8.0	6.0	[13]1-3-4					5.9			
Steen Resources Ltd.—Crossfield, 8-20-30-3 w5m	4.0	3.0	4								[11]4.2
Suncor Inc.—											
Calling Lake South, 1-20-70-20 w4m	10.0	4.3	[7-35]1-4								
Joffre, LSD 13-12-38-12 w4m	6.4	3.1	3					4.3			
Killam, Flagstaff 29, LSD 12-23-42-11 w4m	20.0	1.0	4-[31]5					<0.1			
Pine Creek, 10-23-57-19	13.5	11.6	3						21.0		
Rosevear, ne¼ 16-33-54-15 w5m	30.0	15.0	[7]1-[8]5								[11]4.3
Thorsby, 4-27-49-1 w5m	14.5	10.2	3						10.3		
Texaco-Canada Resources—											
Battle Lake, 23-46-2 w5m	5.5	0.3	3					<0.1			
*Bonnie Glen Cycle, 17-47-27 w4m	140.0	110.3	7		76.3	11.2	27.4			73.5	
Bonnie Glen Gas No. 1, 17-47-27 w4m	50.0	30.1	[19]2		20.8		23.2			19.7	
Bonnie Glen Gas No. 2, 17-47-27 w4m	50.0	36.4	3	196.9	124.6	20.5	44.6			46.6	

Company, plant, location	MMcfd			Production—1,000 gpd (Average based on the past 12 months)							
	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Cynthia, 13 22-49-10 w5m	10.5	3.7	3					9.9		2.4	
Gilby, 15-22-40-3 w5m	58.0	4.5	[19]1		3.4		3.0			3.4	
Magee, 11-20-42-25 w4m	7.0	4.2	3					4.3			
Open Creek 10-34-42-5 w5m	8.0	4.9	3					7.7			
Wabasca, 16-36-80-25 w4m	6.0	4.2	4								
Willesden Green, 17-42-6 w5m	12.2	4.6	3					3.9		2.1	
Total Petroleum Canada Ltd. —											
Gilby, 10 12-41-3 w5m	8.0	6.0	[7]1-4-[32]5								[11]0.9
Hythe, 16-21-73-10 w6m	8.5	8.0	3-4					5.5			[11]3.9
Sutton 7 21-90-4 w6m	3.0	1.3	[13]1-4								
Ulster Petroleums Ltd. —											
Huxley, 7-17-35-24 w4m	3.0	1.5	4								
Irvine, Medicine Hat, 1-23-12-2 w4m	3.5	1.0	4						2.6		
Rumsey, 8-12-34-21 w4m	5.0	4.0	3-4								
Wainwright East GGS, 11-34-44-6 w4m	4.0	1.5	4								
Union Pacific Resources Inc. —											
Baptiste Lake, 14-34-65-24 w4m	22.0	6.0	[7]1								
Cynthia Pembina, 9-16-51-11 w5m	1.2	1.0	3						1.8		
Westcoast Energy Inc. — Ferrier Cardium 2, LSD 1-20-39-7 w5m	23.0	10.4	4								
Total	**22,396.5**	**12,453.0**		**5,210.3**	**2,611.7**	**830.3**	**594.9**	**1,400.8**	**3,710.0**	**3,661.0**	**585.2**

†Fractionation. (Figures in parenthesis do not represent primary production, and are not added in state totals). §And condensate. ¶C_3+

British Columbia

Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Amoco Canada Petroleum Co. Ltd. —											
Alces, 8-34-83-15 w6m	15.9	5.5	1-6								
Buick Creek North, 6-31 e-94 A-14	8.0	0.2	4								
Dahl, a-89 H-94 H-7	8.0	2.6	4								
Laprise, a-40 e-94 H-5	20.0	12.9	4								
Velma, a-89 D-94 H-8	14.0	6.0	4								
Esso Resources Canada Ltd. — Boundary Lake, 1-2-85-14 w6	17.5	8.1	2		13.7		9.0			3.9	
Mobil Oil Canada Ltd. — Sierra, c-91-D 94-I-14	300.0	200.0	[32]5								
Norcen Energy Resources Ltd. — *Jedney, A-62-E/94-G-8	12.0	8.0	4-[31]5								
Petro-Canada Explorations Inc. — Taylor, 3-25& *26-82-18 w6m Plan 7891, Peace River	550.0	360.0	[7]1-[19]2		58.8	25.2	50.4				[11]71.4
Westcoast Energy Inc. —											
Boundary Lake, A-10-25 15 w6m	8.9	2.1	[3]1								
Fort Nelson, Lot 2683, Peace River	750.0	342.0	[3-7-14]1								
Pine River, Lot 1156, Peace River	140.0	36.0	[33]1								
Sikanni, Lot 3472, Peace River	70.0	59.0	[3]1								
Taylor, 2 36-82-18 w4m Peace River Dist., Plan 7891	385.0	NR	7		138.9		50.2			17.7	
Total	**2,299.3**	**1,348.0**		....	**211.4**	**25.2**	**109.8**	....	....	**21.6**	**71.4**

Northwest Territories

Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Amoco Canada Petroleum Co. Inc. — Pointed Mountain, 95-85-n24	188.0	15.8	[13]1-4								
Esso Resources Canada Ltd. — Norman Wells	8.0	1.1	5								
Total	**196.0**	**16.9**		....	....	....	....	....	....	....	....

Saskatchewan

Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Amoco Canada Petroleum Co. Ltd. — Steelman, w½-21-4-5 w2m	18.5	13.9	[7]1-3-4 [23]5-7						104.2		
Anderson Exploration Ltd. — Greenan, 11-12-16-16 w3m	2.0	1.0	4								
Esso Resources Canada Ltd. — Smiley, 8-9-31-25 w3m	3.0	0.4	3						0.5		
Husky Oil Operations Ltd. —											
Hillmond, 35-51-26 w3m	7.5	6.2	[35]1-4								
Macklin, 7-18-37-28 w3m	2.0	1.5	[35]1-4								
Tangleflags, 25-50-25 w3m	7.4	4.6	[35]1-4								
ICG Resources Ltd. —											
Hatton, 4-15-14-27 w3m	9.0	8.0	3-4								
Totnes, 15-33-027-18 w3m	2.5	1.5	4								
Mobil Oil Canada Ltd. — Gull Lake, 9-5-14-19 w3m	1.6	1.0	[7]2							0.3	
North Canadian Oils Ltd. —											
Enterprise, 11-15-28 w3m	25.0	18.0	4								
Golden Prairie, 11-36-14-29 w3m	12.0	11.0	4								
Hatton, 6-28-14-29 w3m	22.0	20.0	4								
Hatton East, 4-21-14-28 w3m	15.0	13.0	4								
Horsham, 18-16-29 w3m	7.5	6.0	4								
Inglenook, 13-8-28-23 w3m	3.0	3.0	3-4								
McLaren Lake, 35-15-29 w3m	1.5	1.5	4								
Richmound, Hatton, 1-4-16-29 w3m	20.0	18.0	4								
Sandhills, 34-13-25 w3m	15.0	13.0	4								
Sask Energy Corp., TransGas Div. —											
Coleville, nw 17-31-23 w3m	40.0	34.0	1-2					12.9			[11]15.5
Hoosier, se 16-30-28 w3m	3.0	1.0	[31]5								[11]2.5
Success, 17-16-17 w3m	50.0	....	[31]5								
Star Oil & Gas Ltd. — Bigstick, 5-11-14-26 w3m	10.0	....	4								
Hatton 3, LSD 4—4-15-14-27 w3m	8.0	8.0	4								
Hatton East, 16-19-13-26 w3m	9.6	9.6	4								
Total	**295.1**	**194.2**		....	....	....	....	**12.9**	**104.7**	**0.3**	**18.0**

Company, plant, location	MMcfd Gas capacity	Gas through-put	Process/ condition method	Production—1,000 gpd (Average based on the past 12 months) Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
CHILE											
Empresa Nacional del Petroleo—Cullen, Magallanes, Primavera	150.0	113.0	1		52.0		37.0			27.0	
Posesión Cabo Negro, Magallanes, San Gregorio	320.0	310.0	7		138.0		83.0			79.0	
Total	470.0	423.0			190.0		120.0			106.0	
CHINA, TAIWAN											
Chinese Petroleum Corp.—Chingtsaohu plant and field, Hsin Chu area	60.0	14.5	7						8.7		
Chinshui plant, field, and area	36.0	16.5	2		6.0		5.4			3.8	
Chuhuangkeng plant, field, and area	75.0	45.7	1								
Tung Hsiao plant, Tieh-Che-Shan field, Tung Hsiao area	100.0	47.1	7	38.5	21.6	1.5	12.1			10.5	
Total	271.0	123.8		38.5	27.6	1.5	17.5		8.7	14.3	
COLOMBIA											
Empresa Colombiana de Petroleos—Barrancabermeja, Santander	100.0	79.0	7	102.5				33.0			
Cicuco, Bolivar	40.0	12.0	3					4.3		2.5	
GLP, El Centro, Santander	48.0	28.0	2		19.0		17.0			25.0	
Tibu, Norte Santander	52.0	9.0	3					11.0		7.0	
Esso Colombiana Ltd.—Provincia, Santander	73.0	73.0	1, 2		34.0		39.0			27.0	
Total	323.0	201.0		102.5	53.0		56.0	48.3		61.5	
DENMARK											
Dansk Naturgas A/S—Nybro, Ribe Amt Jutland	450.0	240.0	VR1 3-6								100.0
DOMINICAN REPUBLIC											
Falconbridge Dominicana C. por A.—Bonao field, Arzo-Nouel Province, LaVega, La Peguera	NR	NR									88.2 189.0
Total											277.2
DUBAI											
ARCO Oil & Gas Co.—Marghan	330.0	330.0	6								650.5
ECUADOR											
CEPE—Ancon, Santa Elena field, Guayas	16.0	5.5	1					1.1		5.6	
Shushufindi, Napo Province	25.0	15.0	3					96.0		31.7	
Total	41.0	20.5						97.1		37.3	
EGYPT											
Amoco Egypt Oil Co.—Abu Gharadig/Dahshour Abu Gharadig field, Western Desert, Block 30	125.0	101.0	7-8					76.0			215.0
Egyptian General Petroleum Corp.—Abu Gharadig field, 286 km west of Cairo, Western Desert	132.0	124.0	5-7								210.0
Abu Madi LTS plant and field, K. Sheikh	242.0	236.0	1-6								203.3
Abu Madi LPG plant and field, K. Sheikh	236.0	225.0	5-7					60.4			215.0
Abu Qir plant and field offshore 60 km east of Alexandria	206.0	198.0	5-7					48.8			206.2
Dahshour, Abu Gharadig field, 65 km west of Cairo, Giza	124.0	118.0	7					132.0			
Ras-Shukeir	177.0	131.0	3-5-7					283.2			190.7
Zeit Bay	78.0	55.0	1-3					64.0			48.4
Total	1,320.0	1,188.0						664.4			1,288.6
FRANCE											
SNEA—Usine de Lacq	570.0	563.0	1		139.0		132.0			270.0	
GERMANY											
Mobil Oil AG—Norddeutsche Erdgas Aufbereitungs GmbH Scholen Concession, Lower Saxony, Sulingen Province (50% MoAG)	291.0	254.0	1								
Wintershall AG—Dueste 3-Staffhorst-Syke, Diepholz, Lower Saxony	35.0	20.0	1 (sulfur recovery only)								
Emlichheim, Lower Saxony	27.0	18.0	2 (sulfur recovery only)								
Ruetenbrock, Ruetenbrock-Fehndorf Haren, Lower Saxony	32.0	32.0	1 (sulfur recovery only)								
Total	385.0	324.0									
GREECE											
North Aegean Petroleum Co.—Gas sweetening plant, Prinos and South Kavala field	27.0	NR	1						72.0		
NGL plant, Prinos and South Kavala field	12.0	NR	3								
Total	39.0	31.2							72.0		

	MMcfd			Production—1,000 gpd (Average based on the past 12 months)							
Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other

HUNGARY

Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
OKGT											
Babócsa plant and field, Somogy	7.0	6.6	6								[11]2.5
Berekfürdő, Tatárülés-Kunmadaras, Szolnok	28.3	11.5	6								
*Demjén plant and field, Heves	5.1	1.8	5								[11]0.2
Ebes plant and field, Hajdu-Bihar	8.5	4.5	6								[11]0.5
Endrőd plant and field, Bekes	70.0	53.0	6						50.3		
Hajduszoboszló plant and field, Hajdu-Bihar	77.7	33.2	[1]2		1.9		1.7	16.3		14.0	[9]7.8
Kardoskút plant, Pusztaföldvár field, Bekes	42.4	13.6	3						9.6		
Kiskunhalas plant and field, Bács-Kiskun	7.1	4.9	6								[11]0.1
Szank plant and field, Bács-Kiskun	77.7	33.2	3						17.8		
Szeged plant, Algyő field, Csongrád	566.0	397.8	[1]2-3-6		48.8	5.8	50.1	108.5		158.8	[1]26.7 [8]20.2 [9]352.3
Tázlár plant and field, Bács-Kiskun	28.3	1.3	6								[11]5.0
Üllés plant and field, Csongrád	160.0	122.2	6						254.9		
Total	**1,078.1**	**683.6**		....	**50.7**	**5.8**	**51.8**	**124.8**	**332.6**	**172.8**	**415.3**

INDONESIA

Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Atlantic Richfield Indonesia Inc.—Ardjuna, nw Java Sea, 90 miles ne of Jakarta	180.0	72.5	7		296.3					181.7	[11]366.4
Mobil Oil Indonesia Inc., *Arun field NGL, Aceh Province, B Block PSC	1,000.0	1,000.0	7						1,200.0		
Pertamina Arun Natural Gas Liquefaction Co.—Pertamina Arun, Aceh Utara, Aceh	1,167.0	1,229.0	6								
Petromer Trend Corp.—Arar, Arar-Klalin field, Irian Jaya Province, Kepala Burung	15.0	12.0	6							20.0	
Walio, Irian Jaya Province, Kepala Burung	2.5	2.5	6							4.0	
Petromina—Mundu, Jatibarang, West Java	35.0	23.5	3					33.0	16.2		
Rantau, North Sumatra	28.0	17.5	1					18.6			
Total Indonesie—Handil CPA, East Kalimantan	200.0	160.0	[12,13]2						45.0		
Senipah Terminal, East Kalimantan	25.0	20.0	[13]1						16.0		
Unocal—Santan LEX, Attaka, East Kalimantan	145.0	128.0	7		130.2				178.5		
Total	**2,797.5**	**2,665.0**		....	**426.5**	....	....	**51.6**	**1,455.7**	**205.7**	**366.4**

ITALY

Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
AGIP SPA—Brugherio, Po Valley	300.0	13.0	1								
Casalborsetti, Porto Garibaldi field, Bologna, Emilia-Romagna, Po Valley	796.0	367.0	1							0.1	
Casirate d'Adda, Malossa field, Bergamo, Lombardia, Po Valley	53.0	10.0	2					2.7	8.0		
Cortemaggiore, Piacenza, Po Valley	106.0	28.0	1							0.1	
Crotone, Luna field, Catanzaro, Calabria	265.0	141.0	1							<0.1	
Falconara, Barbara 'A' field, Ancona	177.0	112.0	1								
Fano, Basil, Pesaro	177.0	27.0	1								
*Gagliano, Enna, Sicily	142.0	11.0	5							6.5	
Grottammare, Emilio-David field, Ascoli Piceno	115.0	51.0	1-2							<0.1	
Hera Lacinia, Crotone, Catanzaro	88.0	22.0	1								
Minerbio, Bologna, Po Valley	1,910.0	125.0	1							<0.1	
Pineto, Fratello-Squalo-Emma field, Roseto, Pescara	177.0	86.0	1								
Ravenna Mare, Porto Corsini, Est-Angela fields, Bologna, Emilia Romagna, Po Valley	354.0	242.0	1							0.3	
Ripalta, Cremona, Po Valley	354.0	77.0	1								
Rubicone, Cervia and Cesenatico fields, Blogna, Emilia-Romagna, Po Valley	265.0	147.0	1							0.2	
Sergnano, Cremona, Po Valley	1,981.0	51.0	1								
Settala, Po Valley	354.0	77.0	1								
Total	**7,614.0**	**1,587.0**		....	....	....	....	**2.7**	**8.0**	**7.5**	....

KUWAIT

Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Kuwait National Petroleum Co.—											
Mina Al-Ahmadi-1	†	†	†		(290.8)	(348.3)				(320.5)	
Mina Al-Ahmadi-2	†	†	†		(541.5)	(648.5)				(596.8)	
*Mina Al-Ahmadi	1,815.0	NR	1-[26,12]2 4-[23]5		1,722.0		980.0			811.8	
Total	**1,815.0**	**1,452.0**		....	**1,722.0**	....	**980.0**	....	....	**811.8**	....

†Fractionation. (Figures in parenthesis do not represent primary production, and are not included in totals)

LIBYA

Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Oasis Oil Co. of Libya Inc.—											
*Bahi, Concession 32	15.0	10.0	2-4								[11]160.0
*Dahra, Concession 32	140.0	20.0	2-4								[11]11.0
Defa, Concession 59 and 71	104.0	47.0	4								[11]210.0
Waha, Concession 59W	52.0	52.0	4								[11]170.0
Occidental of Libya, Inc.—											
103A, Sirte Basin, Petroleum Zone II	670.0	450.0	3						666.0		
103D, Sirte Basin, Petroleum Zone II	420.0	255.0	3						375.0		
Socialist People's Libyan Arab Jamahirya, Marsa Brega	450.0	393.0	NR					37.8	4,536.0		
Total	**1,851.0**	**1,227.0**		....	....	....	....	**37.8**	**5,577.0**	....	**551.0**

Company, plant, location	MMcfd			Production—1,000 gpd (Average based on the past 12 months)							
	Gas capacity	Gas throughput	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other

MALAYSIA

Company, plant, location	Gas capacity	Gas throughput	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Petronas—Dew Point Control Unit, Kerteh, Terengganu	250.0	74.0	6-7		23.2		28.2			57.0	
LPG Unit, Kerth Kemaman, Terengganu	32.0	31.0	[19,26]2	161.4		136.3				97.1	
Total	**282.0**	**105.0**		**161.4**	**23.2**	**136.3**	**28.2**	....	....	**154.1**	....

MEXICO

Company, plant, location	Gas capacity	Gas throughput	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Petroleos Mexicanos—Cactus, Chiapas (6 plants)	1,450.0	975.7	6-7	†4,424.7							
Ciudad Pemex A, Tabasco	550.0	286.7	[19]2	†387.4							
Cuidad Pemex C, Tabasco	200.0	182.0	7	†811.1							
La Venta A, Tabasco	200.0	162.4	[19]2	†521.2							
La Venta C, Tabasco	182.0	212.0	7	†967.9							
Matapionche, Veracruz	50.0	40.7	3								[11]9.5
Nuevo Pemex, Tabasco	500.0	443.0	7	†2,353.9							
Nuevo Pemex, Tabasco	500.0	374.0	7	†1,987.2							
Pajaritos, Coatzacoalcos, Veracruz	192.0	143.3	7	†272.6							
Poza Rica, Veracruz	275.0	295.1	7	†678.9							
Reynosa, Tamaulipas	550.0	255.5	[19]2	†300.0							
Total	**4,649.0**	**3,370.4**		**12,704.9**	....	....	....	....	....	....	**9.5**

†C_2+

NETHERLANDS

Company, plant, location	Gas capacity	Gas throughput	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Amoco Netherlands Petroleum Co.—Alkmaar (Koedijk), Bergen, Bergenmeer, Groet, Schermer, North Holland	**350.0**	**35.0**	[11]**5**	....	....	....	....	....	....	....	[11]**1.8**

NEW ZEALAND

Company, plant, location	Gas capacity	Gas throughput	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Natural Gas Corp. of New Zealand—											
*Kapuni, Taranaki, Lot 1, Dp 5227, Sec. 11, B-XVI, Kaupokouni SD area 11.2.27	100.0	57.0	1-3		39.0					9.0	
*Kapuni	152.0	37.0	3								
Shell BP and Todd Oil Services Ltd.—											
*Kapuni, Taranaki	300.0	121.0	4								[11]209.7
Maui, Oaonui, Taranaki	600.0	318.0	[11,24]2		0.1		1.1	97.0			[11]524.0
Total	**1,152.0**	**533.0**		....	**39.1**	....	**1.1**	**97.0**	....	**9.0**	**733.7**

NORWAY

Company, plant, location	Gas capacity	Gas throughput	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Amoco Norway Oil Co.—Valhall A, 56° 16' 41.395" North, 3° 23' 43.193" East	350.0	70.0	7						200.0		
Statoil—Statpipe, Tysvaer, Rogaland	600.0	437.0	7		682.0	108.0	256.0			193.0	
Total	**950.0**	**507.0**		....	**682.0**	**108.0**	**256.0**	....	**200.0**	**193.0**	

OMAN

Company, plant, location	Gas capacity	Gas throughput	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Sultanate of Oman—Fahud	50.0	25.0	3						12.0		
Rima	2.0	1.4	4-8							13.0	
Saih Nihayda	80.0	24.0	3						5.0		
Sayyala	14.0	7.0	4-8							30.0	
Yibal	80.0	72.0	3						185.0		
Yibal	†	†	†		(0.5)		(8.0)				
Yibal A-B-X	200.0	80.0	3-6								
Yibal C-D	200.0	100.0	6-7								
Total	**626.0**	**309.0**		....	....	....	....	....	**202.0**	**43.0**	....

†Fractionation. (Figures in parenthesis do not represent primary production, and are not included in totals)

PAKISTAN

Company, plant, location	Gas capacity	Gas throughput	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Oil and Gas Development Corp.—											
Loti field, Baluchistan province	20.0		[30]1								
Pirkoh field, Baluchistan province	250.0	138.0	[30]1								
Sari Hundi field, Sind province	25.0		[30]1								
Toot field, Punjab province	20.0	7.0	[30]1								
Pakistan Oilfields Ltd.—*Meyel gas purification plant, Attock district, Punjab province	40.0	17.4	[30]1								[11]5.4
*Meyel LPG plant, Attock district, Punjab province	75.0	25.3	4-[22]5-7					48.8	6.1		[5]3.7
Total	**430.0**	**187.7**		....	....	....	....	**48.8**	**6.1**	....	**9.1**

PERU

Company, plant, location	Gas capacity	Gas throughput	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Petroleos del Peru—Pariñas-Pozo, Piura, Talara	70.0	37.0	2								
Verdun, Pariñas, Piura, Talara					3.4		1.0	5.6	28.9		4.0
Total	**70.0**	**37.0**		....	**3.4**	....	**1.0**	**5.6**	**28.9**	....	**4.0**

QATAR

Company, plant, location	Gas capacity	Gas throughput	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Qatar General Petroleum Corp.—											
Umm Said No. 1, Dukhan field, onshore	339.0	157.6	3		259.4		136.6			74.2	
Umm Said No. 2, offshore	240.0	74.4	1-3		175.2		118.9			98.8	
Total	**579.0**	**232.0**		....	**434.6**	....	**255.5**	....	....	**173.0**	....

SAUDI ARABIA

Company, plant, location	MMcfd: Gas capacity	MMcfd: Gas through-put	Process/ condition method	Production—1 000 gpd (Average based on the past 12 months): Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Arabian American Oil Co.†—Abqaiq	580.0	NR	3-4								
Berri	600.0	NR	[9]1-3-4 [23]5								
Ras Tanura	120.0	NR	[9]1-3-4 [23]5								
Shedgum	1,500.0	NR	[9]1-3-4 [23]5								
Uthmaniyah	1,500.0	NR	[9]1-3-4 [23]5						1,176.0		
Total	**4,300.0**	....		....	....	....	....	....	**1,176.0**	....	....

†Design capacity. Fractionation plants located at Ju'Aymah, Ras Tanura, and Yanbu.

SHARJAH

Company, plant, location	MMcfd: Gas capacity	MMcfd: Gas through-put	Process/ condition method	Production—1 000 gpd (Average based on the past 12 months): Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Amoco Sharjah Oil Co.—Condensate Sep. fac. Sajaa field	550.0	500.0	8								[11]1,341.0
Shalco LPG, Sajaa field	440.0	425.0	7		221.0		251.0				
Total	**990.0**	**925.0**		....	**221.0**	....	**251.0**	....	....	....	**1,341.0**

SPAIN

Company, plant, location	MMcfd: Gas capacity	MMcfd: Gas through-put	Process/ condition method	Production—1 000 gpd (Average based on the past 12 months): Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Repsol Exploración SA—											
*Gaviota P/F, Offshore Bermeo, Vizcaya, Concession I-II	186.0	84.0	[35]1								[11]31.0
*Machichaco, Gaviota, Bermeo, Vizcaya	186.0	84.0	[35]2								[11]42.0
*Serrablo Concession, Sabiñanigo, Huesca	56.0	9.0	[35]1								
Total	**428.0**	**177.0**		....	....	....	....	....	....	....	**73.0**

THAILAND

Company, plant, location	MMcfd: Gas capacity	MMcfd: Gas through-put	Process/ condition method	Production—1 000 gpd (Average based on the past 12 months): Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Petroleum Authority of Thailand— Gas separation Plant I, Rayong, Mabtapud District	350.0	350.0	[23]5-[14]6					400.4		84.0	
Plant II, Dew Point Control, Rayong, Mabtapud District	500.0	200.0	3						8.4		
Total	**850.0**	**550.0**		....	....	....	....	**400.4**	**8.4**	**84.0**	....

UNITED KINGDOM

Company, plant, location	MMcfd: Gas capacity	MMcfd: Gas through-put	Process/ condition method	Production—1 000 gpd (Average based on the past 12 months): Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Amoco U.K.—Bacton, Gordon-Forbes-Esmond, (43/8 13, 15); Leman (49/26 27, 28&53/ 1-2); Indefatigable (49/18 19-23&24)	1,800.0	1,200.0	3								[11]42.0
Northwest Hutton, 211/27	75.0	75.0	7						155.4		
BP Petroleum Development UK Ltd.—Easington and West Sole, Block 48/6, Southern North Sea	300.0	168.0	1-2 4-5								[12]11.8
Kinneil, Forties Field	70.0	48.0	4		332.0		291.0			176.0	
Shell UK Exploration & Production— Bacton, Norfolk, Southern North Sea	662.0										
Mossmorran, Fife, North Sea			†	(Processed 2,492,493 tons NGL feedstock only)							
St. Fergus, Aberdeenshire, North Sea	760.0										
Total Oil Marine Ltd.—Saint Fergus, Frigg field, Grampian province	65.0	46.0	3							1,572.5	
Total	**3,732.0**	**1,537.0**		....	**332.0**	....	**291.0**	....	**155.4**	**1,748.5**	**53.8**

†Fractionation

VENEZUELA

Company, plant, location	MMcfd: Gas capacity	MMcfd: Gas through-put	Process/ condition method	Production—1 000 gpd (Average based on the past 12 months): Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Corpoven											
Guara Oeste, Anzoategui	42.0	45.0	1					15.0		11.5	
Jose, Oriente, Anzoategui			†		(996.0)	(264.4)	(316.7)			(336.8)	(17.0)
Oficina, Anzoategui	9.0	3.0	1					6.3		5.0	
San Joaquin, Oriente, Anzoategui	800.0	870.0	7						1,930.9		
Santa Rosa, Anzoategui	300.0	250.0	2					210.0		71.4	
Lagoven											
Tia Juana 1, Zulia	230.0	210.0	1						180.2		
Tia Juana 2, Zulia	450.0	450.0	3						640.2		
Tia Juana 3, Zulia	455.0	380.0	3						300.7		
Ule fractionation plant, Punta Gorda Zulia			†		(408.2)	(68.9)	(281.8)			(362.0)	
Maraven											
Bajo Grande fractionation plant, Zulia			†		(75.6)		(71.4)			(75.6)	
El Tablazo, Zulia	165.0	134.0	7	213.3	168.0		88.2			67.2	
*Lama Liquido, Zulia	150.0	120.0	3						197.4		
Lamar Liquido, Zulia	162.0	25.0	3						25.2		
La Paz, Zulia	150.0	70.0	1		29.4		25.2			16.8	
Total	**2,913.0**	**2,557.0**		**213.3**	**197.4**	...	**113.4**	**231.3**	**3,274.6**	**171.9**	....

†Figures in parenthesis do not represent primary production, and are not added to totals. Jose plant fractionates raw NGL mix from San Joaquin and Santa Rosa plants. Ule plant fractionates all raw NGL mix from Lagoven plants. Bajo Grande plant fractionates raw NGL mix from Lama and Lamar Liquido plants.

YEMEN

Company, plant, location	MMcfd: Gas capacity	MMcfd: Gas through-put	Process/ condition method	Production—1 000 gpd (Average based on the past 12 months): Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Yemen Hunt Oil Co.—*Alif field, Marib/Al Jawf basin	**400.0**	137.7	[1]1	....	....	....	....	....	....	**86.0**	....

World sulfur derived from oil, gas production

Debra A. Gwyn
Director of Editorial Surveys

As of Jan. 1, 1989

Company and location	Source	Type of process	— Metric tons/day —	
			Design capacity	Production
ABU DHABI				
Abu Dhabi National Oil Co.				
Thammama C. Habshan	nat. gas	3 bed Claus	800.0	400.0
Ruwais	ref. gas	2 bed Claus	93.0	52.0
ARGENTINA				
Duperial				
San Lorenzo	acid gas	Claus	44.2	0
Electroclor SAIC				
Capitan Bermudez, Santa Fe	carb. disulf	....	13.8	12.6
AUSTRALIA				
BP Australia				
Bulwer Island	ref. gas		25.0	15.0
Caltex Refining Co. Pty. Ltd.				
Kurnell, NSW	ref. gas	Claus	70.0	14.5
Petroleum Refineries Australia Pty Ltd.				
Adelaide	ref. gas		26.0	0.6
Altona	ref. gas		25.0	1.2
Shell Refining (Australia)				
Clyde, NSW	ref. gas	Claus-DEA	115.0	5.0
Geelong, Victoria	ref. gas	Claus-DEA	100.0	9.0
AUSTRIA				
OeMV AG				
Aderklaa	nat. gas	Claus	32.0	21.1
Schwechat	ref. gas	Claus	180.0	69.0
Schwechat	flue gas	Claus	34.0	12.0
BAHRAIN				
Bahrain Petroleum Co. BSC (Closed)				
Sitra	ref. gas	Mod. Claus	150.0	130.3
BELGIUM				
Belgian Refining Corp.				
Antwerp	ref. gas	Claus 3 stage	108.0	25.0
Esso Belgium				
Antwerp	ref. gas	2 Claus 1 IFP	350.0	260.0
Fina Raffinaderij Antwerpen				
Antwerp	ref. gas	Claus	225.0	85.0
BRAZIL				
Petrobras				
Refap—Canoas, RS	acid gas	Claus	25.0	15.0
Regap—Betim, MG	acid gas	Claus	60.0	56.0
Repar—Araucária, PR	acid gas	Claus	65.0	43.0
Replan—Paulínia, SP	acid gas	Claus	60.0	33.0
Revap—São Jose Campos, SP	acid gas	Claus	170.0	31.0
Six—Sao Mateus do Sul, PR	acid gas	Claus	23.0	17.0
Petroflex SA				
Duque de Caxias, RJ	acid gas	Claus	40.0	30.0
Ultrafertil SA				
Araucária, PR	resid asphalt	Claus Pool 1500	57.8	33.0
Cubatão, SP	ref. gas acid gas	Claus	45.0	19.0
CANADA				
AEC Oil & Gas Co.				
Hythe-Brainard, Al.	nat. gas	MCRC	120.0	80.0
Amoco Canada Petroleum Co. Ltd.				
Bigstone, Al.	nat. gas	2 bed Mod. Claus	385.0	300.0
Brazeau, Al.	nat. gas	2 bed Claus	110.0	42.0
Caroline, Al.	nat. gas	2 bed Claus	8.3	6.0
Caroline (Garr), Al.	nat. gas	Recycle Selectox	10.4	....
East Crossfield, Al.	nat. gas	2 bed Claus and CBA	1,797.0	858.0
Edson, Al.	nat. gas	3 bed Claus	288.0	95.0
Kaybob I-II, Al.	nat. gas	3 bed Claus & Sulfreen	1086.0	482.0
Lone Pine, Al.	nat. gas	3 bed Claus	283.0	89.0
Steelman, Sask.	nat. gas	Mod. Claus	7.0	....
Sturgeon Lake, Al.	nat. gas	2 bed Claus	98.0	64.0
West Pembina, Al.	nat. gas	2 bed Claus and CBA	340.0	233.0
West Whitecourt, Al.	nat. gas	2 bed Claus	1,330.0	1,031.0
Zama, Al.	nat. gas	2 bed Claus	74.0	32.0
Canadian Occidental Petroleum Ltd.				
Mazeppa, Al.	nat. gas	....	580.0	200.0
Chevron Canada Ltd.				
Burnaby, BC	ref. gas	Stretford	10.0	
Chevron Canada Resources Ltd.				
Kaybob, South Al.	nat. gas	Mod. Claus	3,200.0	....
Esso Resources Canada Ltd.				
Joffre	solution gas	Claus	28.9	17.0
Quirk Creek	nat. gas	Claus-MCRC	305.0	300.0
Redwater	solution gas	Claus	25.0	10.0
Gulf Canada Corp.				
Hanlan-Robb, Al.	nat. gas	Mod. Claus Sulfreen-TG	1,100.0	520.0
Nevis, Al.	nat. gas	Mod. Claus Sulfreen-TG	163.0	110.0
Rimbey, Al.	nat. gas	Mod. Claus	333.0	100.0
Strachan, Al.	nat. gas	4 bed Amoco Cold bed adsorption	1,000.0	450.0
Husky Oil Operations Ltd.				
Nordegg River, Al.	nat. gas	Mod. Claus 2 stage	40.0	22.0
Okotoks, Al.	nat. gas	Mod. Claus 2 stage	440.0	420.0
Rainbow Lake, Al.	oil and gas	Mod. Claus 2 stage	150.0	60.0
Ram River, Al.	nat. gas	Mod. Claus 2 stage Sulfreen	4,600.0	2,900.0
Mobil Oil Canada Ltd.				
Harmattan, Al.	nat. gas	Claus	515.0	29.0
Lone Pine Creek So., Al.	nat. gas	Claus	157.0	84.0
Teepee Creek, Al.	nat. gas	Claus	30.0	14.0
Wimborne, Al.	nat. gas	Claus	182.0	91.0
Norcen Energy Resources Ltd.				
Minnehik-Buck Lake, Al.	nat. gas	Claus 2 stage	35.0	22.0
Pembina Resources Ltd.				
Hartell, Al.	nat. gas	Claus 3 stage	10.7	10.7
Petro-Canada Inc.				
Brazeau, Al.	nat. gas	3 bed MCRC	78.4	78.4
Gold Creek, Al.	nat. gas	Claus 2 stage	100.0	15.0
Wildcat Hills, Al.	nat. gas	Claus 2 stage	170.0	80.0
Petrogas Processing Ltd.				
Balzac, Al.	nat. gas	Amine Claus Sulfreen	1,700.0	750.0
Saratoga Processing Co. Ltd.				
Coleman, Al.	sour gas	Mod. Claus	400.0	261.0
Shell Canada Ltd.				
Sarnia, Ont.	ref. gas	Claus	35.0	15.0
Scotford, Al.	ref. gas	Claus	10.0	43.0
Vancouver, BC	ref. gas	Claus-Scot	15.0	6.0
Shell Canada Ltd.				
Burnt Timber, Al.	nat. gas	Claus	510.0	475.0
Jumping Pound, Al.	nat. gas	Claus	570.0	543.0
Progress, Al.	nat. gas	Claus-MCRC	13.0	5.0
Rosevear, Al.	nat. gas	Claus	170.0	90.0
Simonette, Al.	nat. gas	Claus	100.0	76.0
Waterton, Al.	nat. gas	Claus-Scot	2,900.0	2,297.0
Sulconam Inc.				
Montreal East, Que.	ref. gas	Claus 3 stage	300.0	125.0
Suncor Inc.				
Ft. McMurray, Al.	oil sands	Claus 3 stage	815.0	315.0
Rosevear, Al.	nat. gas	Claus 3 stage	110.0	75.0
Sarnia, Ont.	ref. gas			14.0
Syncrude Canada Ltd.				
Mildred Lake, Al.	oil sands	Mod. Claus 3 stage	530.0	300.0
	oil sands	Mod. Claus 3 stage	530.0	300.0
	oil sands	Mod. Claus 2 stage	700.0	450.0
	oil sands	Sulfreen TG	96.0	45.0
Texaco Canada Resources Ltd.				
Bonnie Glen, Al.	solution gas	Mod. Claus	15.2	8.0
Westcoast Energy Inc.				
Chetwynd, BC	sour gas	MCRC	1,034.0	285.0
Fort Nelson, BC	sour gas	Mod. Claus Sulfreen	650.0	258.0
Taylor, BC	sour gas	Mod. Claus	460.0	242.0

Company and location	Source	Type of process	— Metric tons/day — Design capacity	Production
CHINA, TAIWAN				
Chinese Petroleum Corp.				
Kaohsiung-2	ref. gas	Parsons	45.0	0.7
Kaohsiung-3	ref. gas	Parsons	45.0	5.8
Kaohsiung-4	ref. gas	Parsons	117.0	18.0
Kaohsiung-5	ref. gas	Amoco	200.0	106.0
Kaohsiung-6	ref. gas	Amoco	200.0	39.5
Taoyuan-2	ref. gas	Amoco	120.0	17.9
Taoyuan-3	ref. gas	Amoco	200.0	76.1
COLOMBIA				
Empresa Colombiana de Petroleos				
Barrancabermeja	ref. gas	Claus	50.0	30.0
Barrancabermeja	ref. gas	Claus	15.0	10.0
DENMARK				
A/S Dansk Shell				
Fredericia	ref. gas	Claus	25.0	3.0
Kuwait Petroleum Refining Denmark A/S				
Gulfhavn	refinery	Claus	50.0	45.0
EGYPT				
Ameria Petroleum Refining Co.				
Alexandria	HDS gases	Claus		3.1
General Petroleum Co.				
Ras Gharib	assoc. gas	Claus		8.7
Suez Oil Processing Co.				
El-Suez	ref. gas coker gas	Claus	81.5	9.1
FINLAND				
Neste Oy				
Naantali	ref. gas	Claus	55.0	26.0
Porvoo	ref. gas	Claus	215.0	116.0
FRANCE				
Cie. de Raff. et de Distillation Total France				
Gonfreville l'Orcher	ref H_2S	Claus	190.0	70.7
La Mede	ref H_2S	Claus	190.0	42.4
Mardyck	ref H_2S	Claus	130.0	36.5
Cie. Rhenane de Raffinage				
Reichstett	refinery	Claus	55.0	10.0
Elf France				
Donges	refinery	Claus	210.0	77.0
Feyzin	refinery	Claus	118.0	37.3
Grandpuits	refinery	Claus	125.0	20.3
Esso SA Francaise				
Fos-sur-Mer	refinery	Claus	120.0	30.0
Shell Francaise				
Berre	refinery	Claus	210.0	25.0
Petit-Couronne	refinery	Claus	210.0	30.0
Ste. Francaise des Petroles BP				
Lavera	ref. gas		194.0	192.0
Ste. Francaise Hoechst				
Port Jerome	ref. gas	Claus	240.0	
Ste. Nationale Elf Aquitaine				
Lacq	sour gas	Claus Sulfreen		2,093.1
GERMANY				
Deutsche BP AG				
Vohburg	gas oil	ref. gas	88.0	68.0
Deutsche Marathon				
Burghausen	ref. gas	Claus	33.0	15.0
Deutsche Shell				
Godorf	refinery	Claus-Scot	140.0	75.0
Harburg	refinery	Claus-Scot	78.5	20.0
Deutsche Texaco				
Heide	ref. gas	2 Claus Maxisulf	57.0	21.0
Erdgasaufbereitungsanlage				
Grossenkneten	nat. gas		2,100.0	1,527.0
Erdölraffinerie Ingolstadt AG				
Ingolstadt	gas oil	CBA TG and Claus	27.0	10.0
Erdol-Raffinerie Neustadt GmbH & Co. oHG				
Neustadt-Donau	refinery	Claus Sulfreen	75.0	18.0
Esso				
Ingolstadt	refinery	Claus Sulfreen	50.0	34.0
Karlsruhe	refinery	Claus Sulfreen	100.0	57.0
Mobil Oil AG				
Woerth	ref. gas		60.0	9.3
Mobil AG-Norddeutsche Erdgas Aufbereitungs				
Sulingen	nat. gas	Claus	1,050.0	680.0
OMW GmbH				
Karlsruhe	ref. gas	Claus Sulfreen	175.0	
Ruhr Oel GMBH				
Gelsenkirchen	refinery	Claus-Scot & Sulfreen	445.0	174.0
Union Rheinische Braunkohlen Kraftstoff AG				
Wesseling	refinery	Claus	375.0	85.0
Wintershall AG				
Dueste	nat. gas	Claus	320.0	125.0
Lingen	ref. gas	Claus	112.0	50.0
Mannheim	ref. gas	Claus	52.0	10.0
Ruetenbrock	nat. gas	Claus	7.4	7.1
GREECE				
Hellenic Aspropyrgos Refinery SA				
Aspropyrgos, Attiki	ref. gas	Claus	40.0	
Aspropyrgos, Attiki	ref. gas	Claus	200.0	110.0
Motor Oil Hellas				
Corinth	ref. gas	Claus	90.0	38.0
HUNGARY				
Danube Petroleum Refining Co.				
Szazhalombatta	ref. gas	Claus	77.0	60.0
Tisza Petroleum Refining Co.				
Leninvaros	ref. gas	Claus	24.0	5.3
ISRAEL				
Oil Refineries Ltd.				
Ashdod	HDS & visb	Claus TGT	30.0	30.0
Haifa	FCC	Claus TGT	60.0	30.0
Haifa	HDS & visb	Claus TGT	60.0	30.0
ITALY				
Agip Plus SpA				
Livorno	ref. gas	Claus	60.0	
Agip Raffinazione SpA				
Rho	ref. gas	Claus	50.0	31.6
Sannazzarro	ref. gas	Claus	90.0	36.0
Taranto	ref. gas	Claus	121.0	55.0
Venezia	refinery	Claus	50.0	24.0
API-Raffineria di Ancona SpA				
Falconara	ref. gas	Claus-1	41.0	35.0
	ref. gas	Claus-2	34.0	20.0
Esso Italiana				
Augusta	ref. gas	Claus	104.0	85.0
Trecate	refinery	Claus	98.0	35.0
Isab				
Melilli	refinery		310.0	
Mobil Oil Italiana				
Naples	ref. gas		70.0	20.9
Raffineria Mediterranea SrL				
Milazzo	ref. gas	Claus	100.0	
Saras				
Sarroch	ref. gas	Parsons	35.0	(spare)
Sarroch	ref. gas	Parsons	90.0	75.0
Tamoil Italia SpA				
Cremona	ref. gas	Claus	12.0	7.5
Cremona	ref. gas	Claus	30.0	11.0
JAPAN				
Asia Oil Co. Ltd.				
Sakaide	ref. gas	Parsons	80.0	42.0
Sakaide	ref. gas	Uhde	185.0	110.0
Yokohama	ref. gas	Parsons	200.0	
Cosmo Oil Co. Ltd.				
Chiba	ref. gas	Parsons	600.0	260.0
Sakai	ref. gas	Parsons	140.0	50.0
Yokkaichi	ref. gas	Parsons	200.0	45.0
Fuji Oil Co. Ltd.				
Sodegaura, Chiba	ref. gas	Comprimo	150.0	121.9
Sodegaura, Chiba	ref. gas	Parsons	90.0	
General Sekiyu KK				
Sakai	ref. gas	Claus & Flexsorb SE	193.0	130.0
Idemitsu Kosan Co. Ltd.				
Aichi	ref. gas	Uhde	400.0	196.0
Chiba	ref. gas	Uhde-Parsons	800.0	265.0
Hokkaido	ref. gas	Comprimo	50.0	26.0
Hyogo	ref. gas	Parsons	230.0	105.0
Tokuyama	ref. gas	Girdler-Uhde	235.0	69.0
Kashima Oil Co. Ltd.				
Kashima	ref. gas	Parsons	240.0	150.0
Koa Oil Co. Ltd.				
Marifu	ref. gas	Parsons	45.0	17.0
Marifu	ref. gas	Comprimo	35.0	6.0
Osaka	ref. gas	Parsons	60.0	34.0
Kyokuto Petroleum Industries Ltd.				
Chiba	ref. gas		215.0	21.3
Nichimo Sekiyu KK				
Kawasaki	refinery		22.6	
Nippon Mining Co. Ltd.				
Chita, Aichi	ref. gas	Uhde-Claus	150.0	60.0
Mizushima	ref. gas	Uhde-Claus	200.0	90.0
Mizushima	ref. gas	Comprimo Claus	200.0	90.0

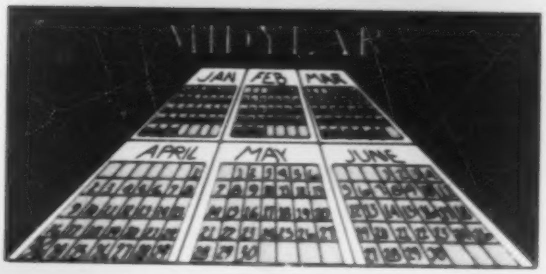
Company and location	Source	Type of process	— Metric tons/day — Design capacity	— Metric tons/day — Production
Nippon Petroleum Refining Co. Ltd.				
Muroran	ref. gas	Parsons	420.0	100.0
Negishi	ref. gas	Parsons	320.0	141.4
Nippon Steel Chemical Co. Ltd.				
Oita	BTX refin.	Scot	3.0	3.0
Tobata	coke oven gas	Claus	2.1	2.1
Okinawa Sekiyu Seisei Co. Ltd.				
Okinawa City	refinery		300.0	180.0
Seibu Oil Co.				
Yamaguchi	refinery		320.0	
Showa Oil Co.				
Kawasaki	fuel oil		80.0	
Showa Yokkaichi Seikyu KK				
Yokkaichi	ref. gas		280.0	
Toa Nenryo Kogyo KK				
Kawasaki	ref. gas	Claus	295.0	66.0
Wakayama	ref. gas	Claus	169.0	62.0
Toa Oil Co.				
Kawasaki	ref. gas	Claus	330.0	131.3
KOREA				
Ssangyong Refining Co. Ltd.				
Onsan	ref. gas	Claus	43.8	28.4
KUWAIT				
Kuwait National Petroleum Co.				
Mina Abdullah	ref. gas	Claus	419.0	75.0
Mina Al-Ahmadi	ref. gas	Claus	1,205.0	340.0
Shuaiba	ref. gas	Claus	1,085.0	315.0
MEXICO				
Petroleos Mexicanos				
Azcapotzalco, DF	ref. gas	Claus	22.6	20.2
Cadereyta, Ver	ref. gas	Claus	71.2	10.9
Cactus, Chis	nat. gas	Claus	1,302.0	628.3
Cuidad Madero, Tamps	ref. gas	Claus	54.8	24.8
Ciudad Pemex, Tab	nat. gas	Claus	650.9	332.4
Matapionche, Ver	nat. gas	Claus	27.1	12.2
Minatitlan, Ver	ref. gas	Claus	71.2	12.3
Nuevo Pemex, Tab	nat. gas	Claus	650.9	238.4
Poza Rica, Ver	nat. gas	Claus	126.6	51.2
Salamanca, Gto	ref. gas	Claus	153.4	11.3
Salina Cruz, Oax	ref. gas	Claus	71.2	23.7
Tula, Hgo	ref. gas	Claus	153.7	28.2
NETHERLANDS				
BP Raffinaderij Nederland NV				
Rotterdam	ref. gas	Claus	172.0	50.0
Esso Nederland				
Rotterdam	refinery	Claus-TGC	564.0	250.0
Kuwait Petroleum Europoort BV				
Europoort	refinery	Claus	48.7	44.0
Nederlandse Aardolie Maat. BV				
Emmen	nat. gas	Sulfinol Claus	80.0	20.0
Shell Nederland Raffinaderij				
Rotterdam	refinery	Claus	540.0	71.0
Texaco				
Pernis	ref. gas	Claus	90.0	44.0
NETHERLANDS ANTILLES				
Refineria Isla Curazao SA				
Emmastad	refinery	Mod. Claus	225.0	61.0
NORWAY				
Norske Shell a.s.				
Sola	refinery	Claus	20.0	4.0
Rafinor a.s.				
Mongstad	ref. gas	Claus	13.0	11.0
PORTUGAL				
Petrogal				
Lisbon	cat cracking gas	Claus	30.0	12.0
Sines	ref. gas	Claus	100.0	13.0
PUERTO RICO				
Puerto Rico Sun Oil Co.				
Yabucoa	gas oil	Claus	60.0	20.0
QATAR				
Qatar Petrochemical Co.				
Umm Said	acid gas	Claus	140.0	112.0
SAUDI ARABIA				
Petromin				
Berri	associated gas	Claus	1,200.0	640.0
Ras Tanura	refinery		270.0	71.0
Shedgum	associated gas	Claus	1,700.0	1,690.0
Uthmaniyah	associated gas	Claus	1,100.0	1,200.0
Petromin Mobil Refining Co.				
Yanbu	refinery		300.0	200.0
Petromin Shell Refining Co.				
Jubail	refinery		300.0	161.0
SINGAPORE				
Esso Singapore PvL.				
Jurong	ref. gas	Claus	128.0	14.0
Mobil Oil Singapore Pty. Ltd.				
Jurong	ref. gas		110.0	31.5
Shell Eastern Petroleum				
Pulau Bukom	refinery	Claus	300.0	42.0
Singapore Refining Co. Pty. Ltd.*				
Jurong	ref. gas	Claus	257.0	75.0
*Singapore Petroleum Co. Pty. Ltd. has 36.7% share in design capacity.				
SOUTH AFRICA				
Mobil Refining Co. of Southern Africa Pty. Ltd.				
Durban	ref. gas		70.0	21.0
National Petroleum Refiners of South Africa Pty. Ltd.				
Sasolburg	crude	Claus	120.0	65.0
Shell & BP South Africa Petroleum Refineries Pty. Ltd.				
Durban	ref. gas		106.0	
SPAIN				
Petronor				
Muskiz, Vizcaya	ref. gas	Claus	229.0	83.0
Repsol Petroleo				
Cartagena	ref. gas	Claus	27.0	
La Coruña	ref. gas	Claus	49.0	2.6
Puertollano	ref. gas	Claus	80.0	34.7
Tarragona	ref. gas	Claus	144.0	81.7
Union Explosivos Rio Tinto SA				
La Rábida, Huelva	ref. gas	Claus	12.0	8.0
SWEDEN				
BP Raffinaderi Goteburg AB				
Gothenburg	ref. gas		6.0	1.5
Shell Raffinaderi BV				
Gothenburg	refinery	Claus	27.0	9.0
Skandinaviska Raffinaderi AB				
Lysekil	refinery	Claus	225.0	75.0
SWITZERLAND				
Raffinerie de Cressier SA				
Cressier	refinery	Claus	20.0	3.0
TURKEY				
Tupras				
Izmir	ref. gas	Claus	14.2	3.0
Izmit	ref. gas	Claus	45.0	5.2
Kirikkale	ref. gas	Claus	23.2	0.5
UNITED KINGDOM				
Amoco U.K.				
Milford Haven	refinery	Claus	76.0	
BP Oil				
Grangemouth	ref. gas		50.0	25.0
Llandarcy	ref. gas		45.0	
Conoco Ltd.				
South Humberside	ref. gas		50.0	35.0
Esso Petroleum Co. Ltd.				
Fawley	ref. gas	Claus	270.0	114.0
Gulf Oil Refining Ltd.				
Milford Haven	ref. gas		10.0	4.1
Lindsey Oil & Refining Ltd.				
Killingholm, South Humberside	ref. gas	Claus	120.0	64.0
Mobil Oil Co. Ltd.				
Coryton	ref. gas		200.0	31.5
Pembroke Cracking Co.				
Pembroke	ref. gas	Claus	160.0	49.0
Shell U.K. Oil				
Shell Haven	ref. gas	Claus	130.0	20.0
Stanlow	ref. gas	Claus	250.0	45.0
UNITED STATES				
American Central Gas Cos. Inc.				
Foster, Ector County, Tex.	nat. gas	Claus	20.0	10.3
Amoco Oil Co.				
Mandan, ND	ref. gas	Claus	15.0	5.0
Texas City, Tex	ref. gas	Claus	1,400.0	550.2
Whiting, Ind	ref. gas	Claus	400.0	215.0
Yorktown, Va	ref. gas	Claus	56.0	45.0
Amoco Production Co.				
Andrews County, Tex	nat. gas	2 bed Claus and CBA	21.8	18.0
Andrews County, Tex	nat. gas	2 bed Claus	5.5	3.7
Ector County, Tex	nat. gas	2 bed Claus	30.0	24.4
Eddy County, NM	nat. gas	2 bed Claus	36.0	24.0
Fremont County, Wyo	nat. gas	2 bed Claus	61.0	17.0
Hockley County, Tex	nat. gas	2 bed Claus	43.0	31.3
Hockley County, Tex	nat. gas	Locat	9.0	
Park County, Wyo	nat. gas	2 bed Claus	76.0	46.7
Sweetwater Co., Wyo	nat. gas	Locat	2.0	2.0
Uinta County, Wyo	nat. gas	2 bed Claus and CBA	1,205.0	1,002.0

			— Metric tons/day —	
Company and location	Source	Type of process	Design capacity	Production
Van Zandt, Tex.	nat. gas	3 bed Claus	313.0	174.0
Wood County, Tex.	nat. gas	2 bed Claus	30.0	12.6
Yoakum County, Tex.	nat. gas	Locat	14.0	3.0
ARCO Products Co.				
Carson, Cal.	ref. gas	Claus	180.0	170.0
Ferndale, Wash.	ref. gas	Claus	180.0	165.0
Ashland Petroleum Co.				
Canton, Oh.	refinery	Claus	50.8	27.9
Catlettsburg, Ky.	refinery	Claus	203.2	141.6
St. Paul Park, Mn.	refinery	Claus	38.6	15.8
Birthright Gas Processing Ltd.				
Birthright, Tex.	nat. gas	Mod. Claus	30.0	7.0
BP Oil Co.				
Belle Chasse, La.	ref. gas	Claus-Scot	50.0	....
Ferndale, Wash.	ref. gas	Claus-Scot	19.5	....
Lima, Ohio	ref. gas	Claus	40.0	....
Marcus Hook, Pa.	ref. gas	Claus-Scot	160.0	....
Toledo, Ohio	ref. gas	Claus-Scot	112.0	....
Cenex				
Laurel, Mont.	ref. gas	Claus	48.7	20.0
Champlin Refining and Chemicals Inc.				
Corpus Christi, Tex.	crude oil	Claus	250.0	170.0
Chevron U.S.A. Inc.				
Carter Creek, Wyo.	nat. gas	Claus	907.0	....
El Paso, Tex.	ref. gas	Claus	42.0	....
El Segundo, Cal.	ref. gas	Claus	750.0	....
Pascagoula, Miss.	ref. gas	Claus	1,000.0	....
Philadelphia, Pa.	ref. gas	Claus	46.0	....
Port Arthur, Tex.	ref. gas	Claus	460.0	....
Richmond, Cal.	ref. gas	Claus	600.0	....
Salt Lake City, Ut.	ref. gas	Claus	12.0	....
Citgo Petroleum Corp.				
Lake Charles, La.	ref. gas	Claus-BSRP	330.0	330.0
Coastal Refining & Marketing Inc.				
Corpus Christi, Tex.	ref. gas	Claus	85.0	60.0
Collet Ventures Inc.				
Chatom, Ala.	sour gas	Claus	140.0	70.0
Conoco				
Commerce City, Colo.	ref. gas	Claus	19.0	16.0
Westlake, La.	ref. gas	Claus	290.0	195.0
Crown Central Petroleum Corp.				
Pasadena, Tex.	ref. gas	Claus	14.3	14.7
Diamond Shamrock R&M Inc.				
Moore County, Tex.	ref-nat. gas	Claus	81.3	20.2
El Paso Natural Gas Co.				
San Juan County, NM	nat. gas	Mod. Claus	53.0	.008
Enron Corp.				
Hobbs, N.M.	nat. gas	Mod. Claus	26.0	8.1
Exxon Co.				
Atascosa County, Tex.	nat. gas	2 reactor split flow Claus		4.5
Baton Rouge, La.	refinery	Claus	599.0	....
Baytown, Tex.	refinery	Claus	1,123.0	....
Benicia, Cal.	refinery	Claus	275.0	....
Crane County, Tex.	nat. gas	2 reactor Claus		11.7
Escambia County, Ala.	nat. gas	3 reactor Claus		845.7
Linden, NJ	refinery	Claus	393.0	
Lincoln and Sweetwater Counties, Wyo.	nat. gas	Claus		894.0
Santa Rosa County, Fla.	nat. gas	3 reactor Claus		174.9
Farmland Industries Inc.				
Coffeyville, Kan.	ref. gas	Claus	19.8	9.3
Fina Oil & Chemical Co.				
Big Spring, Tex.	ref. gas	Claus	50.0	41.0
Port Arthur, Tex.	ref. gas	Claus-Scot	182.0	74.0
Fletcher Oil & Refining Co.				
Carson, Cal.	ref. gas	Locat	10.0	3.0
Frontier Oil Corp.				
Cheyenne, Wyo.	ref. gas	Claus-Scot	35.0	30.0
Cheyenne, Wyo.	ref. gas	Claus-Scot	15.0	....
Hawaiian Independent Refinery Inc.				
Ewa Beach, Hi.	ref. gas-LPG	Claus	14.0	14.0
Ewa Beach, Hi.	ref. gas-LPG	Claus	5.1	0
Hill Petroleum Co.				
Houston, Tex.	ref. gas	Claus	165.0	30.0
Texas City, Tex.	crude oil	Claus	24.5	12.0
Texas City, Tex.	crude oil	Scot	1.4	0.6
Hunt Refining Co.				
Tuscaloosa, Ala.	ref. gas	Claus	80.0	30.0
Koch Hydrocarbon Co.				
McKenzie County, ND	nat. gas		185.0	108.5
Harmony, Miss.	nat. gas		10.0	3.1
Koch Refining Co.				
Corpus Christi, Tex.	ref. gas	Claus	50.0	10.0
Rosemount, Minn.	ref. gas	Claus	447.0	400.0
LaGloria Oil & Gas Co.				
Tyler, Tex.	ref. gas	3 bed Claus	9.9	5.5
LL&E Petroleum Marketing Inc.				
Mobile, Ala.	refinery	Claus-Scot	50.0	0
Lyondell Petrochemical Co.				
Houston, Tex.	ref. gas	Claus	355.0	
Mapco Petroleum Inc.				
Memphis, Tenn.	ref. gas	Claus-Scot	43.0	14.0
Marathon Oil Co.				
Eddy County, NM	nat. gas	Claus	24.0	18.0
Hillside Co., Mich.	nat. gas	Locat	0.5	0.1
Park County, Wyo.	nat. gas	Claus	4.7	4.0
Marathon Petroleum Co.				
Detroit, Mich.	refinery	Claus	80.0	31.8
Garyville, La.	refinery	Claus	450.0	188.8
Robinson, Ill.	refinery	Claus	41.0	31.3
Mobil Exploration & Producing				
U.S.—Mary Ann, Ala.	nat. gas	Claus	225.0	70.0
Mobil Oil Corp.				
Beaumont, Tex.	ref. gas	Claus	100.0	....
Chalmette, la.	ref. gas	Claus	180.0	....
Joliet, Ill.	ref. gas	Claus	315.0	....
Paulsboro, NJ	ref. gas	Claus	135.0	....
Torrance, Cal.	ref. gas	Claus	400.0	....
Montana Sulfur & Chemical Co.				
East Billings, Mont.	ref. gas	Claus	225.0	100.0
Murphy Oil USA Inc.				
Meraux, La.	ref. gas	Claus-Scot	35.0	14.0
Superior, Wis.	ref. gas	Claus	14.0	4.0
Oxy NGL Inc.				
Lignite, ND	nat. gas	....	14.0	4.3
Milnesand, NM	nat. gas	....	23.0	7.1
Myrtle Springs, Tex.	nat. gas	....	304.0	44.7
Welch, Tex.	nat. gas		1.5	0.6
Pennzoil Products Co.				
Shreveport, La.	ref. gas	Claus	11.7	2.2
Phillips 66 Co.				
Borger, Tex.	refinery	Claus	240.0	....
Chatom, Ala.	nat. gas	Claus	193.0	....
Crane, Tex.	nat. gas	Claus	88.0	....
Eunice, NM	nat. gas	Claus	64.0	....
Fullerton, Tex.	nat. gas	Claus	61.0	....
Goldsmith, Tex.	nat. gas	Claus	145.0	....
Lee, NM	nat. gas	Claus	62.0	....
Sweeny, Tex.	refinery	Claus	275.0	....
Rock Island Refining Corp.				
Indianapolis, Ind.	ref. gas	Claus	20.3	5.0
Shell Oil Co.				
Anacortes, Wash.	ref. gas	Claus-Scot	20.0	....
Deer Park, Tex.	ref. gas	Claus-Scot	410.0	....
Martinez, Cal.	ref. gas	Claus-Scot Stretford	225.0	....
Norco, La.	ref. gas	Claus-Scot	45.0	
Wilmington, Cal.	ref. gas	Claus-Scot	200.0	
Wood River, Ill.	ref. gas	Claus-Scot	300.0	
Shell Western E&P Inc.				
Bryans Mill, Tex.	nat. gas	Claus	175.0	
Clark Avenue, Cal.	nat. gas	Claus-Scot	4.0	
Denver Unit, Tex.	nat. gas	Claus	4.0	
Goodwater, Miss.	nat. gas	Claus	50.0	
Manistee County, Mich.	nat. gas	Claus	25.0	
Thomasville, Miss.	nat. gas	Claus	1,245.0	
Shell Smackover Ltd.				
Eustace, Tex.	nat. gas	Claus-Scot	660.0	
Sid Richardson Carbon & Gasoline Co.				
Winkler County, Tex.	nat. gas		20.0	8.8
Star Enterprise				
Convent, La.	ref. gas.	Claus	660.0	
Delaware City, Del.	ref. gas	Claus	317.0	
Port Arthur, Tex.	ref. gas	Claus	238.0	
Texaco Inc.				
Franklin County, Tex. li	nat. gas	Claus	219.0	50.0
Freestone County (Aker), Tex.	nat. gas	Claus	181.0	90.0
Freestone County (Teas), Tex.	nat. gas	Claus	138.0	110.0
Texaco Refining & Marketing Inc.				
Anacortes, Wash.	ref. gas	Claus	63.0	
Bakersfield, Cal.	ref. gas	Claus	40.0	
El Dorado, Kan.	ref. gas	Claus	181.0	
Wilmington, Calif.	ref. gas	Claus	279.0	
Texas Oil & Gas Corp.				
Coyanosa, Tex.	nat. gas	Claus	25.0	4.4
Pittsburg, Tex.	nat. gas	Claus	100.0	71.3
Teague, Tex.	nat. gas	Claus	10.0	2.4
Tosco				
Martinez, Cal.	ref. gas	Claus-Scot	180.0	115.0
Total Petroleum Inc.				
Alma, Mich.	ref. gas	Claus	13.2	12.4
Ardmore, Ok.	ref. gas	Claus	18.3	10.0
Arkansas City, Kans.	ref. gas	Claus	11.2	7.6
Denver, Colo.	ref. gas	Claus	6.1	1.5
Trans-Jeff Chemical Corp.				
Tilden, Tex.-No. 1	acid gas	Claus	20.1	
Tilden, Tex.-No. 2	acid gas	Claus	76.1	32.0
Ultramar Refining				
Wilmington, Cal.	ref. gas	Claus	132.0	112.0
Unocal Corp.				
Lemont, Ill.	ref. gas	Claus Bevon Stretford	300.0	
Lemont, Ill.	ref. gas	Claus	100.0	

Company and location	Source	Type of process	— Metric tons/day — Design capacity	Production
Nederland, Tex.	ref. gas	Claus	17.0	.....
Rodeo, Cal.	ref. gas	Claus Stretford	350.0	.....
Santa Maria, Cal.	ref. gas	Claus Unisulf	139.0	.....
Wilmington, Cal.	ref. gas	Claus Stretford	200.0	
Valero Refining and Marketing Co.				
Corpus Christi, Tex.	ref. gas	Claus	310.0	250.0
Warren Petroleum Co.				
Como, Hopkins County, Tex.	nat. gas	Claus	75.0	.....
Fashing, Atascosa County, Tex.	nat. gas	Claus	36.0	.....
Little Knife, Billings County, ND	nat. gas	Claus	125.0	.....
Monument, Lea County, NM	nat. gas	Claus	32.0	.....
Sand Hills, Crane County, Tex.	nat. gas	Claus	45.0	.....
VENEZUELA				
Corpoven				
El Palito, Carabobo	refinery	Claus	36.0	19.0
Lagoven				
Amuay, Falcon	refinery	Claus	600.0	178.0
Maraven				
Cardon, Falcon	refinery	Claus	94.0	30.0

Coastal Oil & Gas Corp.'s gas transmission systems use 20 gas-storage sites to meet peak demand (photo courtesy Coastal)

OGJ SPECIAL



Seismic survey of the Carter Creek gas field in Wyoming last year is said to be the largest land-based three-dimensional survey ever in the lower 48 states. Data will be processed this year. Photo courtesy Chevron Corp.

U.S. demand is still strong; upstream spending sluggish

Robert J. Beck
Economics Editor

A new OPEC quota agreement and the group's subsequent cutback in production at the start of the year gave a welcome boost to world crude oil prices.

But higher prices have not been translated into expanded drilling activity, either in the U.S. or elsewhere.

Companies are still wary of the new price level and have been reluctant to commit funds to new upstream development projects. The result in the U.S. has been an active rig count that is languishing at depressed levels and is almost sure to post a record low for the year.

Although last fall's OPEC agreement strengthened prices during the first half of 1989, there were differences at last month's quota-setting meeting that could again lead to overproduction and downward pressure on prices.

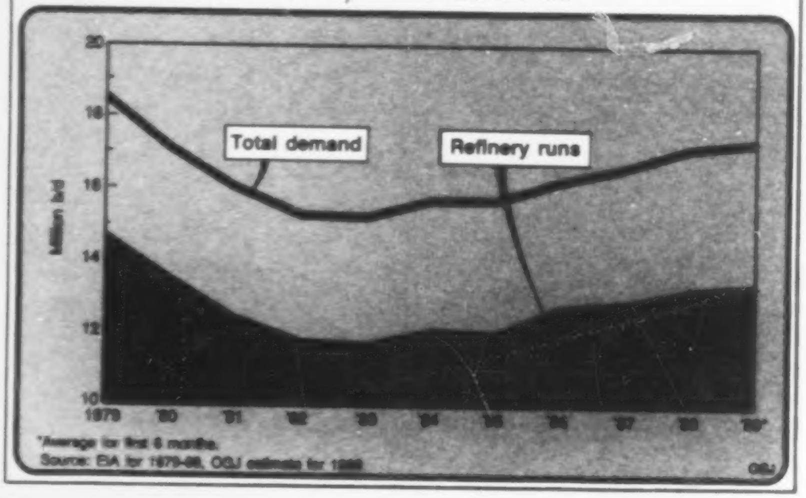
Higher crude oil costs have cut into refining margins, but strong product demand has enabled refiners to increase product prices and offset a portion of the decline.

And petroleum product demand will likely remain strong throughout the year, making 1989 another good year for refiners.

Following are the highlights of Oil & Gas Journal's midyear review of industry activity and expectations for the full year of 1989.

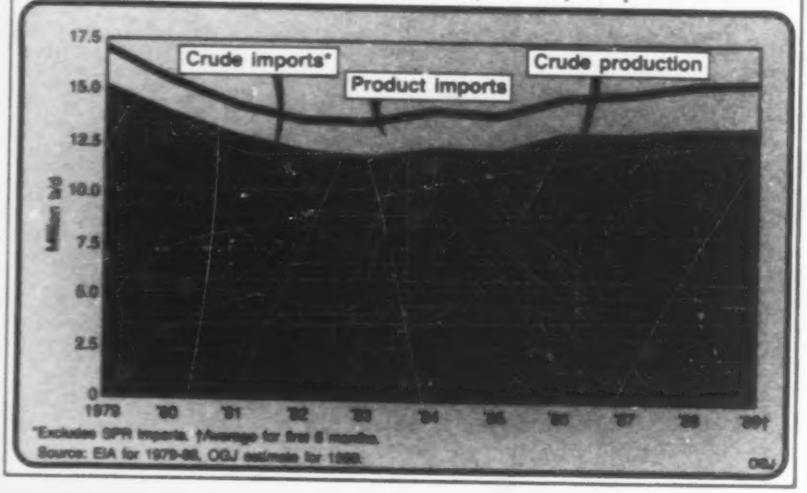
- Demand for petroleum products in the U.S. will increase 1.6%, as expected at the start of the year.
- U.S. crude and condensate production will be down much more than anticipated, averaging 4.1% below 1989. Production cutbacks following the oil spill will lower average output for the year in Alaska, and a record low rate of drilling will result in a sharper decline in the lower 48.
- Total imports will increase by 9.8% to make up the difference between increasing demand and falling U.S. production.
- Refinery runs will gain 1.9% for the year, bringing the refinery utilization rate to 87.3%.
- Increased worldwide demand will boost output by both OPEC and non-OPEC producers.
- Crude prices will average consid-

Oil demand, refinery runs advance



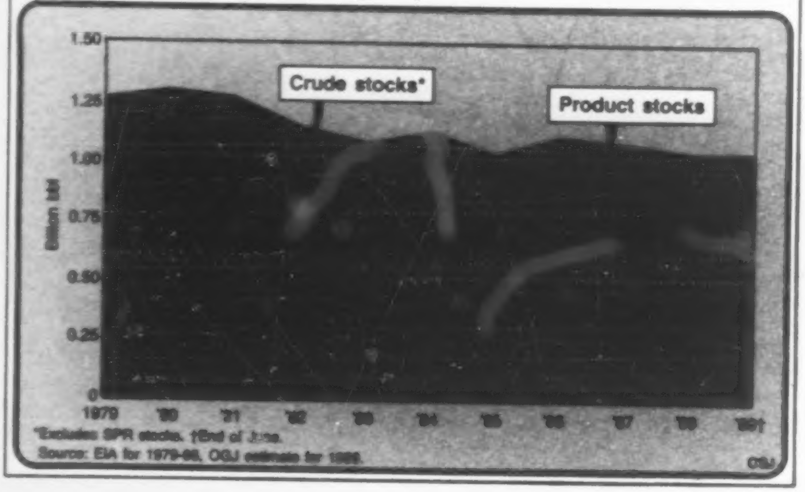
*Average for first 6 months.
Source: EIA for 1979-88, OGJ estimate for 1989.

Crude production drops, imports jump



*Excludes SPR imports. †Average for first 6 months.
Source: EIA for 1979-88, OGJ estimate for 1989.

Crude stocks gain slightly



*Excludes SPR stocks. †End of June.
Source: EIA for 1979-88, OGJ estimate for 1989.

erably higher in 1989 due to strong demand and production restraint by OPEC producers.

1989 overview. Continued economic growth and still modest prices for petroleum products are the key reasons for continued growth in demand.

Oil & Gas Journal forecasts 1989 U.S. demand for all petroleum products will average 17.56 million b/d, up 1.6% from 17.283 million b/d in 1988. First half 1989 demand is estimated at 17.27 million b/d, up 1.5% from the first half a year ago; second half average will be 17.85 million b/d.

Total demand, including exports of crude oil and products, will increase to 18.38 million b/d, also up 1.6% from 1988. Exports are expected to increase 0.9% to 820,000 b/d.

This forecast is consistent, in terms of the growth rate, with the one OGJ made earlier this year (OGJ, Jan. 30, p.49). But the level of demand is 185,000 b/d higher due to an upward revision by the Energy Information Administration in their estimate of 1988 demand.

Demand increases will be spread across all major product groups. The largest gain—84,000 b/d—will be for motor gasoline. Although pump prices are up from a year ago, the increase has not led to a cutback in driving by U.S. motorists.

A surprising trend is the expected 47,000 b/d increase in demand for residual fuel oil. At the relatively low crude prices of recent years, resid demand has been experiencing a revival.

The oil spill in Alaska's Prince William Sound resulted in curtailed Alaska crude and condensate output in March and will lower average production for the year.

This is a major reason why total U.S. production will be down more sharply than expected.

A depressed level of drilling activity in the lower 48 also accelerated the decline.

Total petroleum imports will continue to climb in 1989, gaining another 9.8%.

Increased supplies will have to come from imports. Stocks are close to the minimum level needed to avoid supply disruptions and can provide only contingency relief.

Refineries should continue to benefit from increased demand. With crude runs up 2.1% this year and refinery capacity down about 1.5% from 1988, capacity utilization rate will average 87.3%.

Prices. OPEC production restraint and strong demand strengthened crude prices for the first half of 1989; prices are expected to remain near

U.S. demand still climbing in 1989, crude supply shrinking

	First half 1989		Third quarter 1989		Fourth quarter 1989		Year 1989	
	Volume, 1,000 b/d	% change from 1988	Volume, 1,000 b/d	% change from 1988	Volume, 1,000 b/d	% change from 1988	Volume, 1,000 b/d	% change from 1988
Demand								
Motor gasoline	7,305	0.9	7,585	1.6	7,485	1.8	7,420	1.1
Dist. 1-4	6,063	0.9	6,308	1.5	6,200	1.8	6,158	1.2
Dist. 5	1,242	0.9	1,277	1.8	1,285	1.8	1,262	0.9
Naphtha jet fuel	205	– 3.1	210	1.0	220	– 0.5	210	– 1.4
Dist. 1-4	143	– 3.7	149	0.7	155	—	148	– 1.7
Dist. 5	62	– 1.6	61	1.7	65	– 1.5	62	– 0.8
Kerosine jet fuel	1,240	1.2	1,285	6.0	1,355	6.6	1,280	3.6
Dist. 1-4	908	1.1	917	5.9	998	6.5	933	3.6
Dist. 5	332	1.4	368	6.4	357	6.9	347	3.6
Distillate fuel oil	3,180	0.3	2,900	4.7	3,340	1.0	3,150	0.9
Dist. 1-4	2,767	0.3	2,448	4.7	2,901	1.0	2,721	0.8
Dist. 5	413	0.4	452	4.1	439	0.9	429	1.4
Residual fuel oil	1,460	8.0	1,300	4.0	1,500	– 3.8	1,430	3.4
Dist. 1-4	1,190	9.5	1,020	2.2	1,220	– 5.2	1,155	4.1
Dist. 5	270	1.7	280	11.1	280	2.9	275	2.6
LPG and ethane	1,680	2.9	1,575	1.9	1,865	0.5	1,700	2.0
Dist. 1-4	1,590	2.9	1,498	1.8	1,777	0.5	1,614	2.0
Dist. 5	90	3.4	77	2.7	88	1.1	86	2.4
Other products	2,200	0.4	2,750	7.8	2,330	1.3	2,370	2.6
Dist. 1-4	1,856	0.4	2,337	7.8	1,930	1.0	1,995	2.6
Dist. 5	344	0.6	413	8.1	400	2.6	375	3.0
TOTAL DOMESTIC DEMAND	**17,270**	**1.5**	**17,605**	**3.7**	**18,095**	**1.4**	**17,560**	**1.6**
Dist. 1-4	14,517	1.6	14,677	3.5	15,181	1.2	14,724	1.4
Dist. 5	2,753	0.9	2,928	4.5	2,914	2.4	2,836	2.9
EXPORTS	**830**	**– 1.1**	**800**	**3.4**	**820**	**– 0.4**	**820**	**0.8**
Dist. 1-4	370	– 5.1	350	1.4	360	1.4	363	– 1.9
Dist. 5	460	2.4	450	4.9	460	– 1.7	457	2.7
TOTAL DEMAND	**18,100**	**1.3**	**18,405**	**3.6**	**18,915**	**1.3**	**18,380**	**1.6**
Dist. 1-4	14,887	1.4	15,027	3.4	15,541	1.2	15,087	1.3
Dist. 5	3,213	1.1	3,378	4.5	3,374	1.8	3,293	2.8
Supply								
DOMESTIC PRODUCTION								
Crude & lease condensate	7,825	– 5.3	7,800	– 2.6	7,790	– 2.4	7,810	– 4.1
Dist. 1-4	4,880	– 5.2	4,790	– 2.9	4,770	– 2.8	4,830	– 4.5
Dist. 5	2,945	– 5.5	3,010	– 2.0	3,020	– 1.6	2,980	– 3.3
NGL and other hydrocarbons	1,685	1.4	1,680	– 0.1	1,670	– 2.9	1,680	0.1
Dist. 1-4	1,585	1.7	1,580	– 0.1	1,570	– 3.1	1,580	0.2
Dist. 5	100	– 3.0	100	—	100	1.0	100	– 1.0
IMPORTS								
Crude	5,400	10.9	6,080	18.1	6,000	12.5	5,720	13.2
Dist. 1-4	5,210	10.7	5,860	17.5	5,740	12.2	5,505	8.8
Dist. 5	190	16.2	220	35.0	260	19.8	215	7.0
Products & unfinished oils	2,350	6.4	2,250	1.4	2,450	– 3.4	2,350	2.5
Dist. 1-4	2,242	6.5	2,135	1.6	2,341	– 3.6	2,240	2.5
Dist. 5	108	4.3	115	– 2.5	109	1.9	110	1.9
Total	7,750	9.5	8,330	15.0	8,450	9.1	8,070	9.8
Dist. 1-4	7,452	9.4	7,995	14.7	8,081	8.9	7,745	9.6
Dist. 5	298	11.6	335	20.9	369	15.3	325	14.9
OTHER SUPPLY								
Processing gain, loss, etc.	850	3.8	900	– 2.3	860	1.9	865	1.6
Dist. 1-4	699	3.7	678	– 2.3	738	1.9	704	1.7
Dist. 5	151	4.1	222	– 2.2	122	1.7	161	1.6
TOTAL NEW SUPPLY	**18,110**	**1.6**	**18,710**	**4.8**	**18,770**	**2.6**	**18,425**	**2.3**
Dist. 1-4	14,616	3.0	15,043	6.7	15,159	3.3	14,859	3.4
Dist. 5	3,494	– 3.8	3,667	– 0.2	3,611	—	3,566	– 2.3
STOCK CHANGE	10	—	305	—	(145)	—	45	—
Dist. 1-4	(271)	—	(16)	—	(382)	—	(228)	—
Dist. 5	281	—	289	—	237	—	273	—
CRUDE RUNS TO STILLS	**13,360**	**1.6**	**13,820**	**1.7**	**13,580**	**2.3**	**13,530**	**2.1**
TOTAL INPUT TO STILLS	**13,530**	**1.5**	**13,990**	**2.1**	**13,750**	**2.6**	**13,700**	**1.9**
TOTAL REFINERY CAPACITY	**15,715**	**– 1.1**	**15,675**	**– 1.8**	**15,675**	**– 1.6**	**15,695**	**– 1.5**
REFINERY UTILIZATION (%)	**86.1**	**2.6**	**89.3**	**3.8**	**87.7**	**4.4**	**87.3**	**3.4**
TOTAL INDUSTRY STOCKS*	**1,040**	**– 2.0**	**1,068**	**– 0.5**	**1,055**	**1.6**	**1,055**	**1.6**
Refined products*	700	– 0.3	728	– 2.3	715	1.0	715	1.0
Crude*	340	– 5.3	340	3.7	340	3.0	340	3.0
Govt. SPR crude stocks*	570	3.6	575	3.6	580	3.6	580	3.6

* Million bbl at end of period

First half crude, condensate decline again

	1,000 b/d		
	First half 1989*	First half 1988	% Change
PAD District 1	**36**	40	-10.0
Florida	**20**	22	-9.1
Others	**16**	18	-11.1
PAD District 2	**798**	848	-5.9
Illinois	**62**	63	-1.6
Kansas	**155**	165	-6.1
Michigan	**65**	66	-1.5
North Dakota	**102**	109	-6.4
Oklahoma	**342**	363	-5.8
Others	**72**	82	-12.2
PAD District 3	**3,514**	3,717	-5.5
Alabama	**56**	57	-1.8
Arkansas	**35**	39	-10.3
Louisiana	**1,148**	1,253	-8.4
Mississippi	**74**	75	-1.3
New Mexico	**190**	197	-3.6
Texas	**2,011**	2,097	-4.1
PAD District 4	**532**	568	-6.3
Colorado	**87**	88	-1.1
Montana	**60**	65	-7.7
Utah	**84**	93	-9.7
Wyoming	**301**	322	-6.5
PAD District 5	**2,945**	3,108	-5.2
Alaska	**1,911**	2,031	-5.9
California	**1,025**	1,069	-4.1
Others	**9**	8	12.5
Total	**7,825**	**8,281**	**-5.5**

*Estimated.

Energy consumption and efficiency

Year	GNP, Billion 1982 $	Energy consumption, Trillion BTU	**Energy consumption per GNP $, 1,000 BTU**	Oil consumption, Trillion BTU	**Oil consumption per GNP $, 1,000 BTU**
1929	711.8	23,756	**33.4**	5,521	**7.8**
1933	501.6	16,900	**33.7**	4,833	**9.6**
1940	775.0	23,589	**30.4**	7,407	**9.6**
1946	1,077.8	30,494	**28.3**	10,002	**9.3**
1950	1,206.6	33,992	**28.2**	13,489	**11.2**
1955	1,494.9	39,703	**26.6**	17,524	**11.7**
1960	1,665.3	44,569	**26.8**	20,067	**12.1**
1965	2,087.6	53,343	**25.6**	23,242	**11.1**
1970	2,416.2	67,143	**27.8**	29,537	**12.2**
1971	2,484.8	68,348	**27.5**	30,570	**12.3**
1972	2,608.5	71,643	**27.5**	32,966	**12.6**
1973	2,744.1	74,282	**27.1**	34,840	**12.7**
1974	2,729.3	72,543	**26.6**	33,455	**12.3**
1975	2,695.0	70,546	**26.2**	32,731	**12.1**
1976	2,826.7	74,362	**26.3**	35,175	**12.4**
1977	2,958.6	76,289	**25.8**	37,122	**12.5**
1978	3,115.2	78,088	**25.1**	37,965	**12.2**
1979	3,192.4	78,898	**24.7**	37,123	**11.6**
1980	3,187.1	75,952	**23.8**	34,202	**10.7**
1981	3,248.8	73,989	**22.8**	31,931	**9.8**
1982	3,166.0	70,840	**22.4**	30,232	**9.5**
1983	3,279.1	70,497	**21.5**	30,054	**9.2**
1984	3,501.4	74,060	**21.2**	31,051	**8.9**
1985	3,607.5	73,944	**20.5**	30,922	**8.6**
1986	3,713.3	74,260	**20.0**	32,196	**8.7**
1987	3,847.0	76,768	**20.0**	32,865	**8.5**
1988	3,996.1	79,948	**20.0**	33,959	**8.5**
1989*	4,105.0	81,280	**19.8**	34,500	**8.4**
Percentage change					
1929-40	8.9	-0.7	**-9.0**	34.2	**23.1**
1940-50	55.7	44.1	**-7.2**	82.1	**16.7**
1950-70	100.2	97.5	**-1.4**	119.0	**8.9**
1970-88	65.4	19.1	**-28.1**	15.0	**-30.3**

* Estimate.

current levels for the second half if those same market conditions continue.

OPEC overproduction led to a sharp drop in prices during the last half of 1988.

The average price of internationally traded export crudes averaged $15.09/bbl during first half 1988, but fell to an average of $12.50/bbl during the second half.

Prices averaged $16.48/bbl during the first half of this year. The price at the end of June was $16.87/bbl, up from $14.08/bbl at the end of June 1988 when prices had started falling.

If OPEC production is reasonably well balanced with demand, the price for the year could average close to $16.50/bbl, up 20% over 1988.

The U.S. average wellhead price of crude oil was $14/bbl for January and February, up slightly from $13.53/bbl last year. More recent figures aren't available but the U.S. wellhead price closely tracks the world export price. OGJ is expecting the U.S. price to average about $14.40/bbl for the year, up 15% from 1988.

Product prices have moved up along with crude prices. Strong demand has allowed refiners to pass through the higher feedstock costs.

The OGJ survey of self-service unleaded motor gasoline pump prices shows the average price for the first half of 1988 at $1.006/gal compared to 93.53 ¢/gal last year, an increase of 7.6%. The price at the end of June was $1.0702/gal, up 12.9% from 94.79 ¢/gal at the end of June 1988.

The increase in the pump price during the first half was in line with the 9.2% increase in the average price of export crudes.

OGJ expects the average pump price for all types of motor gasoline, including premium grades, to be $1.103/gal, up 14.5% from 96.3 ¢/gal in 1988. This price level is still well below the peak of $1.353/gal in 1981.

Gasoline taxes for the first half of 1989 averaged 24.16 ¢/gal, up from 23.82 ¢/gal for the same period a year ago.

Residential heating oil prices were up only 0.9% above 1988 for the first two months of this year, averaging 85.25 ¢/gal. However, OGJ expects heating oil prices to catch up with crude oil price gains and average 93.3 ¢/gal for the year, up 14.6% from 1988.

The increase in natural gas consumption over the past few years is also having an impact on natural gas prices. Gas prices peaked in 1984 at $2.66/Mcf. But prices dropped sharply as demand weakened, and fell to $1.67/Mcf in 1987. With stronger demand prices moved up again last year and averaged $1.71/Mcf.

Natural gas consumption in the U.S. totaled 17.951 tcf in 1984. It fell sharply to 16.221 tcf in 1986 but recovered to 18.036 tcf last year.

OGJ expects the increased consumption to result in an average price of $1.75/Mcf for 1989.

Spot prices for natural gas have become seasonally volatile, and prices can vary widely from region to region.

Energy demand. The U.S. economy's record setting period of economic growth is now in its seventh year.

Real gross national product (GNP) is projected to increase 2.7% in 1989. This will be the slowest growth rate posted over those seven years, but it is not even close to a recession.

In recent years, growth in energy intensive industries has resulted in an energy consumption growth rate closer to that of the GNP. From 1982-1986 the economy grew at an average annual rate of 4.1% while energy growth averaged only 1.2% per year.

In 1987, GNP and energy both gained 3.4%, and in 1988 energy use increased 4.1% while the economy grew only 3.9%.

This year, some energy conservation is again expected to be evident with energy consumption increasing 1.7% to 81.28 quadrillion BTU (quads), compared to the economic growth rate of 2.7%.

Energy consumption per unit of GNP fell continuously from 1970-1987, dropping 28.2%. There was a marginal reversal last year when this ratio increased 0.3%; energy efficiency is expected to improve again in 1989 by about 1%.

Oil energy demand is expected to increase 1.6% in 1989 to 34.5 quads. But oil's share of total energy demand will slip to 42.4%, from 42.5% in 1988 and 42.8% in 1987.

Demand for energy from natural gas will increase 0.8% in 1989 to 18.75 quads. Its market share will slip to 23.1% from 23.3% in 1988.

Energy from coal will also increase 0.8% to 18.98 quads, dropping its market share to 23.4% from 23.5% last year.

Hydroelectric and geothermal energy will account for 3.8% of the market, gaining 7.2% to 3.1 quads.

Nuclear energy will continue to meet a substantial portion of the growth in demand for electricity. Nuclear energy output will increase 4.8% to 5.95 quads, representing 7.3% of the market. The growth rate will be slower than in past years, and curtailment of new construction is expected to slow the future growth rate.

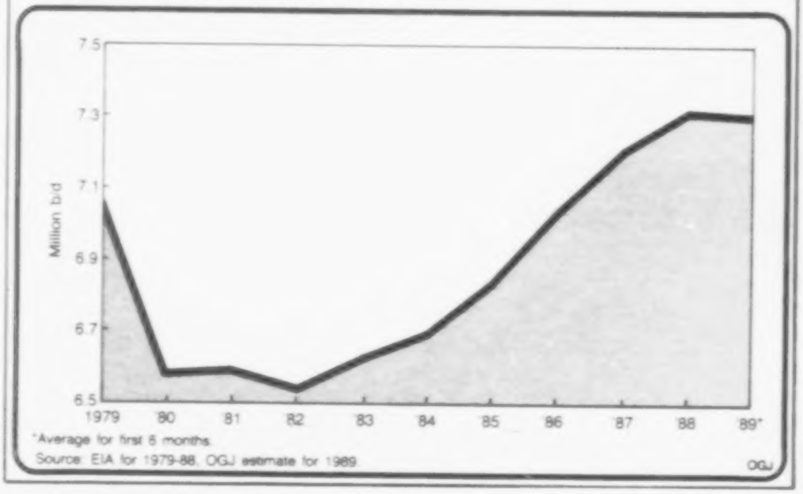
This may result in a move to coal and natural gas for additional power

U.S. crude and products prices

Year	Average wellhead price crude, $/bbl	Refiner's acquisition cost of crude $/bbl	Retail motor gasoline, all types ¢/gal	Residential heating oil, ¢/gal*	Average wellhead price natural gas, $/Mcf
1976	8.19	10.89	59.5	40.6	0.58
1977	8.57	11.96	63.1	46.0	0.79
1978	9.00	12.46	65.2	49.0	0.91
1979	12.64	17.72	88.2	70.4	1.18
1980	21.59	28.07	122.1	97.4	1.59
1981	31.77	35.24	135.3	119.4	1.98
1982	28.52	31.87	128.1	116.0	2.46
1983	26.19	28.99	122.5	107.8	2.59
1984	25.88	28.63	119.8	109.1	2.66
1985	24.09	26.75	119.6	105.3	2.51
1986	12.51	14.55	93.1	83.6	1.94
1987	15.40	17.90	95.7	80.3	1.67
1988	12.57	14.71	96.3	81.4	1.71
1989E	14.40	16.85	110.3	93.3	1.75

Source: 1976-1988, EIA; 1989, OGJ estimate

Gasoline demand is firm



*Average for first 6 months.
Source: EIA for 1979-88, OGJ estimate for 1989.

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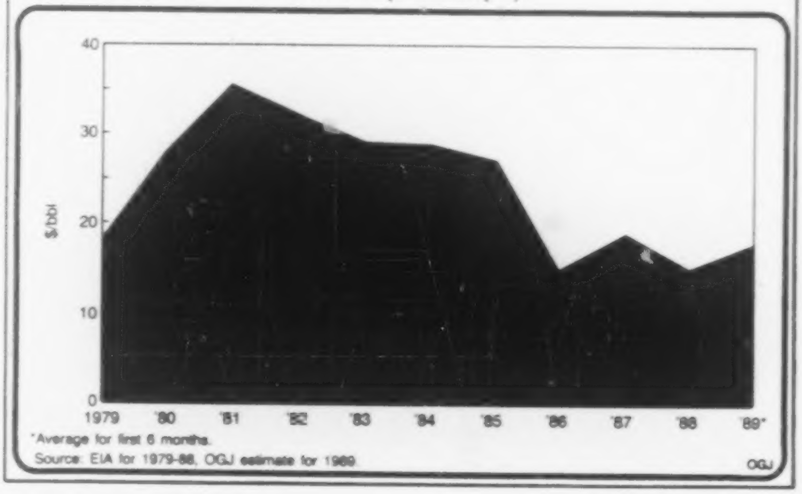
Refiners' crude costs up sharply



*Average for first 6 months.
Source: EIA for 1979-88, OGJ estimate for 1989.

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U.S. energy demand

	— Trillion BTU —			Trillion BTU, 1989	% change	— % of total energy —		
	1987	1988	% change			1987	1988	1989
Oil	32,865	33,959	3.3	34,500	1.6	42.8	42.5	42.4
Natural gas	17,668	18,595	5.2	18,750	0.8	23.0	23.3	23.1
Coal	18,008	18,825	4.5	18,990	0.8	23.5	23.5	23.4
Nuclear	4,906	5,678	15.7	5,950	4.8	6.4	7.1	7.3
Hydro & other	3,321	2,891	−12.9	3,100	7.2	4.3	3.6	3.8
Total	**76,768**	**79,948**	**4.1**	**81,[illegible]**	**1.7**	100.0	100.0	100.0

Source: 1987 and 1988, EIA; 1989, OGJ estimate.

U.S. natural gas supply and demand

	Billion cu ft			% change 1988/87	Bcf 1989	% change 1989/88
	1986	1987	1988			
Production						
Texas	6,152	6,126	6,211	1.4	6,280	1.1
Louisiana	4,895	5,123	5,096	– 0.5	5,150	1.1
Other states	5,744	6,100	6,150	0.8	6,230	1.3
Total production	**16,791**	**17,349**	**17,457**	**0.6**	**17,660**	**1.2**
Imports						
Canada	748	992	1,266	27.6	1,360	7.4
Mexico	0	0	0	—	0	—
LNG*	2	0	17	—	40	135.3
Total imports	**750**	**992**	**1,283**	**29.3**	**1,400**	**9.1**
Supplemental gas	113	101	142	40.6	140	– 1.4
Losses, etc.†	– 1,225	– 1,245	– 623	– 50.0	– 900	44.5
Total new supply	**16,429**	**17,197**	**18,259**	**6.2**	**18,300**	**0.2**
Supply from storage	– 147	– 6	– 124	—	– 30	—
Total supply	**16,282**	**17,191**	**18,135**	**5.5**	**18,270**	**0.7**
Exports	61	54	99	83.3	90	–9.1
Total consumption	**16,221**	**17,137**	**18,036**	**5.2**	**18,180**	**0.8**

*LNG imports from Indonesia in 1986, from Algeria in 1988 and 1989. †Extraction losses and unaccounted for gas.
Source: 1986, 1987 and 1988, EIA; 1989, OGJ estimate.

U.S. refinery utilization

	1,000 b/d			% Utilization rate
	Crude runs	Input to distillation units	Operable capacity	
1979	[illegible]	14,950	17,660	84.7
1980	[illegible]	13,788	18,209	75.7
1981	12,471	12,751	18,603	68.5
1982	11,766	12,176	17,445	69.8
1983	11,345	11,645	16,831	69.2
1984	12,044	12,335	16,034	76.9
1985	12,002	12,161	15,671	77.6
1986	12,716	12,817	15,467	82.9
1987	12,851	12,999	15,643	83.1
1988	13,246	13,447	15,927	84.4
1989*	13,530	13,700	15,695	87.3
1979-89 change				
Volume	–1,116	–1,250	–1,965	2.6
Percent	– 7.6	– 8.4	– 11.1	3.1
1988-89 change				
Volume	284	253	– 232	2.9
Percent	2.1	1.9	– 1.5	3.4

*OGJ estimate
Source: EIA

generation in future years.

Products demand. U.S. petroleum products demand remained strong during the first half of 1989, even though product prices were rising. Demand totaled an estimated 17.27 million b/d, up 1.5% from first half 1988.

The increase in product prices was not enough to stall demand growth, primarily because prices still remained well below the record levels of the 1981-1982.

All of the major products posted demand increases in the first half and all are expected to show increases for the full year.

Demand for motor gasoline continues to increase even though vehicle fleet efficiency is constantly improving. Demand for first half 1989 was 7.305 million b/d, up 0.9% from the same period of 1988.

The sharpest rise during the first half was in demand for resid. Demand gained 8% over first half 1988 at 1.46 million b/d, an increase of over 100,000 b/d. Relatively low resid prices and continued economic growth have strengthened demand for heavy fuel oil.

First half demand increases for other major products include: distillate, 10,000 b/d; kerosine jet, 15,000 b/d; and LPG and ethane, 45,000 b/d. Demand for other products was up 10,000 b/d.

Demand growth will be at about the same pace in the second half, increasing 1.7% over 1988 to 17.85 million b/d. Demand for the year is projected by OGJ at 17.56 million b/d, up 1.6% or 277,000 b/d, from 1988.

This is a continuation in the recovery of demand for oil products. U.S. consumption peaked in 1978 at 18.847 million b/d.

The resurgence in residual fuel oil demand has been a surprise. Since 1985 demand, has been closely following price movements.

This year is slightly different. Even though crude oil prices increased during the first half of 1989, resid demand was up 8% at 1.46 million b/d. OGJ is projecting resid demand of 1.43 million b/d for the year, up 3.4% from 1988.

A conservation response to higher motor gasoline prices is not evident in the demand figures for first half 1989. Demand for motor gasoline was up 0.9% at 7.305 million b/d.

Economic growth, increased employment, higher personal income, and a larger vehicle fleet seem to have offset the impact of higher prices and increased vehicle efficiency.

OGJ expects gasoline demand to average 7.42 million b/d for the year, up 1.1% over 1988. This would be a record year for gasoline consumption; the previous high was 7.412 million b/d in 1978.

U.S. demand for jet fuel will increase 2.8% this year to 1.49 million b/d. Demand for naphtha jet fuel for the military is expected to decline 3,000 b/d to 210,000 b/d. The military is converting some of its aircraft in Europe and Asia to kerosine jet fuel and demand for this product may be falling in the future.

Kerosine jet fuel for commercial aviation will increase 3.6% in 1989 to 1.28 million b/d. International passenger travel has continued strong, and both international and domestic air freight activity have increased.

Distillate demand will increase a modest 0.9% in 1989 to 3.15 million b/d, reaching the highest level since 1979. Demand during the first half was 3.18 million b/d, up 0.3%.

Transport and industrial demand are expected to remain strong due to increased economic activity. But this will be offset by a further decline in residential and commercial consumption. Increased heating unit efficiency and conversions to natural gas are reducing demand in this sector.

Demand for LPG and ethane was up 2.9% during the first half at 1.68 million b/d. For the year, OGJ projects demand at 1.7 million b/d, up 2%. Continued growth in the petrochemical industry is the major reason for the increase.

Demand for all other petroleum products is projected to increase 2.6% to 2.37 million b/d. Included are asphalt, lubricants, petroleum coke, petrochemical feedstocks, and miscellaneous products.

Natural gas. U.S. demand for natural gas is expected to increase only 0.8% in 1989 to 18.18 tcf. Last year, demand surged 5.2%.

Marketed production of natural gas in the U.S. is expected to increase by 1.2% to 17.66 tcf; imports will rise 9.1% to 1.4 tcf. Most imports will still come from Canada, and will reach 1.36 tcf, up 7.4%. But there will also be a small but steady supply of LNG from Algeria, amounting to 40 bcf for the year.

The level of demand for natural gas will depend on the price of resid. A portion of natural gas demand is very sensitive to the relative cost of competing fuels. If the price of resid moves up, then utilities and industrial facilities with multi-fuel capability could turn to natural gas.

Supply. U.S. crude and condensate production will continue the decline that started in early 1986. And the curtailment of Alaska production in March will exaggerate the decline this year.

First-quarter worldwide production compared

Country	1,000 b/d First quarter 1989	1,000 b/d First quarter 1988	Change	% Change
Non-OPEC				
U.S.	7,784	8,323	-539	-6.5
Canada	1,584	1,583	1	0.1
Brazil	560	588	-28	-4.8
Mexico	2,607	2,637	-30	-1.1
Other (Non-OPEC)	1,226	1,127	99	8.8
Western Hemisphere	13,761	14,258	-497	-3.5
Norway	1,399	1,101	298	27.1
United Kingdom	1,826	2,521	-695	-27.6
Other	504	523	-19	-3.6
Western Europe	3,729	4,145	-416	-10.0
Egypt	865	864	1	0.1
Other (Non-OPEC)	934	904	30	3.3
Africa	1,799	1,768	31	1.8
Oman	630	580	50	8.6
Other (Non-OPEC)	528	437	91	20.8
Middle East	1,158	1,017	141	13.9
Australia	509	543	-34	-6.3
India	651	625	26	4.2
Malaysia	562	540	22	4.1
Other (Non-OPEC)	290	299	-9	-3.0
Asia-Pacific	2,012	2,007	5	0.2
Total Non-OPEC	22,459	23,195	-736	-3.2
OPEC	20,287	17,582	2,705	15.4
Total Non-Communist	42,746	40,777	1,969	4.8
Communist				
China	2,788	2,707	81	3.0
USSR	12,329	12,514	-185	1.5
Other	407	407	—	—
Total Communist	15,524	15,628	-104	-0.7
Total World	**58,270**	**58,405**	**1,865**	**3.3**

Source: Oil & Gas Journal.

Crude and products stocks*

	1,000 bbl †1989	% Change 1989/88	1,000 bbl †1988	% Change 1988/87	1,000 bbl †1987
Motor gasoline	222,100	5.7	210,088	-8.8	230,421
Naphtha jet fuel	6,100	-9.5	6,741	-7.2	7,262
Kerosine jet fuel	39,800	2.5	38,811	0.3	38,677
Distillate fuel oil	98,900	-10.4	110,418	5.8	104,391
Residual fuel oil	42,100	-0.2	42,165	2.0	41,356
Unfinished oils	116,000	0.5	115,423	12.7	102,392
Other	175,000	-2.4	179,249	6.3	168,676
Total products stocks	**700,000**	**-0.4**	**702,895**	**1.4**	**693,175**
Crude stocks	340,000	-5.3	358,858	9.5	327,598
Total	**1,040,000**	**-2.0**	**1,061,753**	**4.0**	**1,020,773**

*Excludes Strategic Petroleum Reserve. †At end of June.
Source: 1987-88, EIA; 1989, OGJ estimate.

World crude prices rebound

Country	Type of crude and API gravity	Current price,* $/bbl	Change 6-'89/1-'89 %	In effect Jan. 1, 1989, $/bbl	Change '89/'88, %	In effect Jan. 1, 1988, $/bbl	In effect Jan. 1, 1987, $/bbl	In effect Jan. 1, 1986, $/bbl	In effect Jan. 1, 1985, $/bbl
OPEC									
Saudi Arabia	Arabian Light 34°	16.40	24.7	13.15	−24.9	17.52	16.15	28.00	29.00
Abu Dhabi	Murban 39°	16.80	22.6	13.70	−23.5	17.92	15.55	28.15	29.31
Algeria	Saharan 44°	18.55	15.2	16.10	−14.7	18.87	17.30	29.50	30.50
Nigeria	Bonny Light 37°	18.50	22.9	15.05	−20.5	18.92	17.13	28.65	28.00
Libya	Es Sider 37°	17.80	15.6	15.40	−16.8	18.52	16.95	30.15	30.15
Indonesia	Minas 34°	18.35	18.4	15.50	−11.7	17.56	16.28	28.53	29.53
Venezuela	Tia Juana 31°	19.66	60.2	12.27	−30.4	17.62	15.10	28.05	29.84
Total OPEC		**16.62**	**24.4**	**13.36**	**−20.3**	**16.77**	**16.10**	**27.81**	**28.43**
OTHER									
U.K.	Brent blend 38°	17.90	13.3	15.80	−12.2	18.00	18.25	26.00	28.65
Norway	Ekofisk 42°	18.45	16.4	15.85	− 9.9	17.60	16.86	26.61	28.50
Mexico	Isthmus 33°	18.44	26.9	14.53	− 2.0	14.83	17.00	26.21	29.00
U.S.S.R.	Export blend 32°	17.05	17.2	14.55	− 7.9	15.80	18.30	28.15	28.00
Total World		**16.93**	**24.7**	**13.58**	**− 18.0**	**16.57**	**16.24**	**27.10**	**28.33**
U.S.†		15.57	12.9	13.79	1.1	13.64	13.79	23.96	24.28

* Represents estimated contract prices based on government stated prices, netback deals and spot market quotations. Prices for 1983–1986 were official prices. † U.S. average crude oil wellhead price; current price is OGJ estimate.

Source: Energy Information Administration

OPEC production

Country	1,000 b/d First quarter 1989	First quarter 1988	Change	% Change	OPEC quota 1,000 b/d
Algeria	668	604	64	10.6	733
Ecuador	288	311	− 23	− 7.4	242
Gabon	191	158	33	20.9	175
Indonesia	1,200	1,100	100	9.1	1,307
Iran	3,028	1,935	1,093	56.5	2,783
Iraq	2,643	2,646	− 3	− 0.1	2,783
Kuwait	1,166	1,134	32	2.8	1,093
Libya	1,067	1,000	67	6.7	1,093
Neutral Zone*	391	226	165	73.0	—
Nigeria	1,400	1,283	117	9.1	1,428
Qatar	397	345	52	15.1	329
Saudi Arabia	4,638	4,197	441	10.5	4,769
United Arab Emirates	1,574	1,066	508	47.7	1,041
Venezuela	1,636	1,577	59	3.7	1,724
Total OPEC	**20,287**	**17,582**	**2,705**	**18.4**	**19,500**

*Shared by Kuwait and Saudi Arabia

Production during the first half of 1989 averaged an estimated 7.825 million b/d, down 5.3% from the first half of 1988. Part of the reason for the sharp decline was the 120,000 b/d drop in Alaska production to 1.911 million b/d. Alaska production was not expected to fall off in 1989, but the temporary shutdown resulting from the oil spill lowered the first half average.

Lower 48 production was down 336,000 b/d in the first half of this year, to 5.914 million b/d.

Production is expected to decline at a slower rate throughout the remainder of 1989 as Alaska production returns, falling to 7.79 million b/d in the fourth quarter.

For the year, U.S. crude production is projected at 7.81 million b/d, down 4.1% or 350,000 b/d, from the 1988 average. In January, OGJ expected a 1989 decline of only 160,000 b/d.

U.S. production reached a recent peak in 1985 at 8.971 million b/d, and averaged 9.108 million b/d during the first quarter of 1986.

In addition to the drop in Alaska production as a result of the oil spill, a change in the state's tax laws is slowing—and possibly eliminating—some development projects that could help maintain Alaska output. The outlook for the second half is for an improvement in Alaska production but not to the levels previously anticipated.

Alaska output is expected to average about 1.981 million b/d for the second half and 1.946 million b/d for the year, compared with 2.017 million b/d last year.

Lower 48 production is projected at 5.864 million b/d for 1989, 259,000 b/d or 4.2% below 1988.

None of the major producing states posted production increases for the first half of 1989.

Imports. Because of increasing demand and declining domestic production, imports are playing a steadily more significant role in meeting U.S. supply requirements.

And low stock levels prevent industry from dipping into inventories to meet demand.

Total imports, excluding crude for the Strategic Petroleum Reserve (SPR), were 7.75 million b/d during the first half, up 9.5% from 1988. Imports are expected to reach 8.39 million b/d during the second half, bringing the average for the year to 8.07 million b/d, up 9.8%.

This level will be surpassed only by the 1977-1979 period when industry imports averaged 8.487 million b/d.

Imports will account for 46% of domestic demand this year, compared with 42.5% in 1988. The only year with a higher dependency ratio was 1977 at 47.7%.

Crude imports, excluding the SPR, are projected to increase to 6.04 million b/d in the second half, up from 5.4 million b/d the first half. Crude imports for the year will average 5.72 million b/d, up 13.2% from 1988.

Crude imports by the government

for the SPR are expected to average about 55,000 b/d in 1989.

Product imports are also expected to be up again in 1989. During the first half, product imports averaged 2.35 million b/d, up 6.4% from 1988. There should be little change in the second half, resulting in an average of 2.35 million b/d for the year, up 2.5% from a year ago.

Any increase in resid demand usually results in increased imports and this is expected to be the case this year. According to the American Petroleum Institute (API), resid imports were up 18.5% for the first five months of 1989. There may also be an increase in gasoline imports because of tight U.S. refining capacity.

For the first quarter of 1989 the leading source of crude imports was Saudi Arabia at 1.179 million b/d, up 30.7% from first quarter 1988. Crude imports from Saudi Arabia had fallen to only 131,000 b/d in 1985.

Total crude imports from OPEC countries averaged 3.052 million b/d for the first quarter, up 13.2% from the same period a year ago.

First quarter product imports from OPEC were 822,000 b/d, down 0.2% from a year earlier. Total imports from OPEC, at 3.874 million b/d, represented half of total first quarter U.S. petroleum imports.

Stock levels at the end of the first half were marginally higher than year end 1988, and inventories made no contribution to supply during first half 1989. Crude stocks increased by about 9 million bbl to 340 million bbl and are expected to remain close to that level throughout the second half.

Product stocks, which dipped to 700 million bbl, will be increased in the second half to meet the higher winter demand and are expected to end the year at about 715 million bbl.

Total industry stocks at midyear represented 60.2 days of demand and at end year will be 60.1 days, relatively low by historical standards.

World production. After setting new production quotas for first half 1989, OPEC managed to reduce substantially its excess output. The result was higher crude oil prices.

The present OPEC quotas, effective July 1989, call for maximum total production by OPEC members of 19.5 million b/d. All members signed the agreement but Kuwait and U.A.E. rejected their quotas. This has added uncertainty to the market.

During the first quarter of 1989, OPEC output averaged 20.287 million b/d, considerably above the quota but not enough to depress oil prices. In fact, export crude prices moved up throughout the first quarter.

In April, OPEC output reached 21.178 million b/d, halting the steady rise in prices. Average export prices peaked at $18.92/bbl in mid April, up from $13.58/bbl at the end of 1988.

U.S. imports

Sources of crude imports*

Country	Share of total 1989, %	First quarter average 1989, 1,000 b/d	Change 1989/1988, %	Annual average 1988, 1,000 b/d	Change 1988/1987, %	Annual average 1987, 1,000 b/d
Algeria	1.2	65	13.0	58	-49.8	115
Indonesia	3.4	180	- 3.5	186	-29.0	262
Nigeria	12.6	663	9.3	607	14.7	529
Saudi Arabia	22.4	1,179	30.7	902	40.5	642
Venezuela	8.3	438	- 0.4	439	-10.0	488
Other OPEC	10.0	527	4.7	504	38.4	364
Total OPEC	58.0	3,052	13.2	[illegible]	12.3	2,400
Angola	4.1	215	5.8	203	12.8	180
Canada	11.9	626	- 8.0	681	11.9	608
Colombia	2.9	153	45.2	106	- 8.2	115
Mexico	13.1	691	2.6	674	11.9	602
Trinidad & Tobago	1.4	76	6.2	71	- 4.8	75
United Kingdom	2.4	127	-50.0	254	-16.5	304
Other Non-OPEC	6.1	319	-24.6	423	8.4	390
Total imports	100.0	5,259	3.0	5,107	9.3	4,674

Sources of refined product imports

Country	Share of total 1989, %	First quarter average 1989, 1,000 b/d	Change 1989/1988, %	Annual average 1988, 1,000 b/d	Change 1988/1987, %	Annual average 1987, 1,000 b/d
Algeria	9.3	234	- 3.6	242	34.7	180
Saudi Arabia	4.1	104	-36.1	162	47.5	110
Venezuela	17.1	430	21.2	365	12.3	316
Other OPEC	2.2	55	-15.0	64	17.0	55
Total OPEC	32.7	822	- 0.2	[illegible]	[illegible]	[illegible]
Brazil	4.5	112	14.5	98	16.9	84
Canada	14.0	353	10.6	319	32.8	240
Mexico	2.1	53	-27.8	73	38.3	53
Netherlands	2.7	68	11.9	61	1.3	60
Romania	1.0	26	-55.4	58	6.9	54
Virgin Islands	14.6	369	52.5	242	-11.1	272
Other Non-OPEC	28.4	715	15.1	621	7.2	579
Total imports	100.0	2,518	9.7	[illegible]	14.5	2,004

*Includes imports for the Strategic Petroleum Reserve.
Source: Energy Information Administration

Prices have slipped since then, averaging $16.02/bbl in mid June. But prices on the futures market firmed up early this month, indicating some confidence in OPEC's ability to limit production.

And demand for OPEC oil is expected to be up substantially this year. If members keep production near quota levels, it could bring some stability to world oil prices.

Total non-Communist production for the first quarter of 1989 was up 4.8% from a year ago at 42.746 million b/d. OPEC production was up 15.4% at 20.287 million b/d. A decline in non-OPEC output of 3.2% to 22.459 million b/d, contributed to the increased call on OPEC oil.

Sharp declines in the U.S., down 539,000 b/d and the U.K., down 695,000 b/d, were the major cause of the non-OPEC drop. An increase of 298,000 b/d in Norwegian production partially offset these declines.

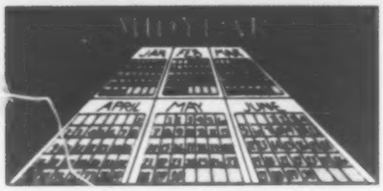
The International Energy Agency is projecting a 1 million b/d increase in non-Communist petroleum consumption in 1989, to 51.2 million b/d. IEA is projecting only a minor increase of 100,000 b/d in non-OPEC supply.

Assuming no change in stock levels this translates into an increase of 700,000 b/d in demand for OPEC crude, up to an annual average of 20.2 million b/d. Last year the IEA estimated OPEC crude output at 19.5 million b/d.

Second quarter demand for OPEC oil will be the lowest for the year at an estimated 18.7 million b/d, depending on the timing of the stock build up.

Demand for OPEC oil will increase through the remainder of the year to an estimated 21.6 million b/d in the fourth quarter.

Barring an economic recession it appears that conditions in the oil market are beginning to shift in OPEC's favor. ▪



Turnaround expected in second half, but it won't be enough to bring drilling to '88 level

John C. McCaslin
Exploration Editor

Despite firmer-than-expected crude prices during the first half of 1989, U.S. operators have held back drilling funds.

Operators should realize a 6.7% increase in wellhead revenues to $72 billion, but they are cutting outlays about 8.5% to $8.8 billion.

Even with a likely upturn in activity during the second half, total completions for the year will be considerably below the 36,500 wells forecast at the beginning of the year.

After dealing with post-crash oil prices in the low teens, it was generally believed that operators would boost drilling activity if the futures price for West Texas Intermediate hovered in the $20/bbl range.

It hasn't happened—at least not yet.

U.S. drilling activity continues to be depressed. U.S. rotary rigs averaged 785 vs. 980 for the first 4 months of 1989, down 20%.

Part of the reason is a lack of confidence that prices will stay at that level, though in today's market, 6 months of fairly constant prices can pass for "stability."

Another reason drilling activity hasn't responded to higher crude prices is weak natural gas prices.

Slack winter demand kept pressure on gas prices, and the excess producing capacity that has plagued markets for most of the 1980s still has not disappeared.

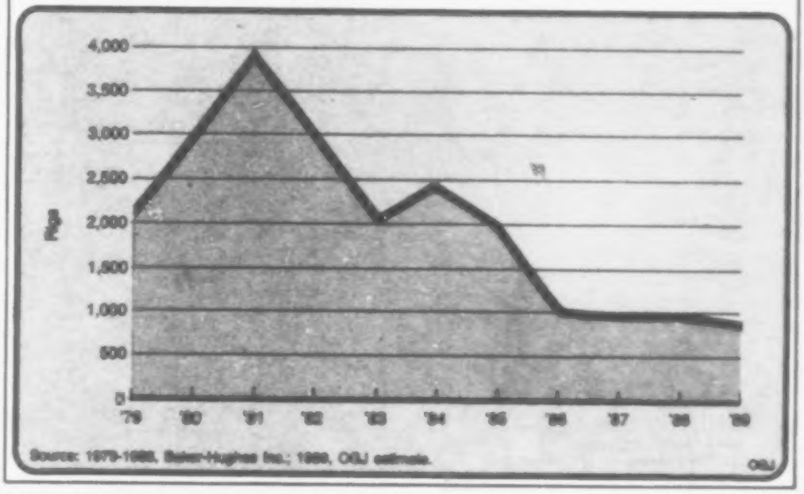
Rigs drilling gas prospects increased as a share of the total in late 1988 and early this year on the expectation that seasonal demand would tighten gas markets and raise prices.

When that didn't happen, gas drilling slumped again.

In July 1988, according to Independent Petroleum Association of America, 33% of the active rigs were looking for gas. That percentage rose to almost 47% in early February 1989, then declined to 40% before recovering to 45% this month.

Baker Hughes, which counts active rotary rigs, forecasts an average rig count for the year of 879.

U.S. active rotary rigs



Source: 1979-1988, Baker-Hughes Inc.; 1989, OGJ estimate.

Nor does future drilling activity depend wholly on economics.

Environmental disasters of the first half promise new delays in offshore exploration and in assessing the Arctic National Wildlife Refuge; and mandated changes in energy use to meet government clean air programs will have a long term effect on energy consumption and the energy mix.

With half the year gone, here are highlights of Oil & Gas Journal's updated look at 1989:

- The U.S. active rotary rig count will average 850, down 9% from last year's average of 936.
- Operators will drill about 27,935 wells in the U.S.in 1989, down significantly from the 36,500 wells forecast in January.
- Exploratory drilling will slump further, to an estimated 5,291 wildcats for the year.
- Total footage drilled in 1989 will be 136 million ft of hole; average well depth is expected to be about 4,867 ft.
- Major operators now plan to drill 4,895 wells in 1989, down considerably from the number planned as the year began, and well below the 6,103 wells drilled by the large companies in 1988.
- Drilling in western Canada will likely see about 5,918 wells completed in 1989. This compares with 6,600 wells predicted last winter.

The U.S. industry drilled an estimated 12,598 wells during the first half of 1989, including 2,680 wildcats and 9,918 field development wells. Total footage for the period was 61 million ft.

Typically, about 40% of the years' wells are drilled in the first half of the year and activity picks up in the second half. Major companies plan a strong increase in the second half as they did in 1987, but there is a question as to how much independents will pick up the pace.

Stronger gas prices and continued stability in the crude market will be the keys to the size of the drilling activity increase in the second half. Petroleum demand is certainly headed in the right direction.

Coupled with the streamlining that companies have already done, and still-low drilling costs, reasonably firm markets could bring a healthy increase in activity by year end.

But operators have never been more cautious. And without additional encouraging signals, gains this year will be modest at best.

The majors' report

	All wells				Wildcats	
	First half 1989	Planned last half	Total Drilled 1989	Total 1988	Planned 1989	Drilled 1988
Alabama	218	169	387	165	5	11
Alaska	63	88	151	140	15	5
Arkansas	7	3	10	15	4	10
California	515	529	1,044	1,784	26	15
Colorado	61	58	119	124	2	15
Florida	3	4	7	4	6	3
Idaho	0	0	0	1	0	1
Illinois	40	48	88	119	1	0
Kansas	52	91	143	169	1	3
Kentucky	0	0	0	10	0	1
Louisiana	190	315	505	551	125	204
North	15	39	54	37	3	9
South	61	73	134	158	27	41
Offshore	114	203	317	356	95	154
Michigan	11	54	65	180	13	31
Mississippi	3	4	7	28	1	11
Montana	5	10	15	64	1	17
Nebraska	3	2	5	12	2	10
Nevada	1	2	3	5	3	4
New Mexico	30	90	120	127	7	20
North Dakota	8	13	21	27	5	12
Oklahoma	62	168	230	244	19	24
Oregon	1	0	1	13	1	0
Pennsylvania	47	59	106	99	1	0
Texas	547	1,147	1,694	2,009	102	147
South	41	129	170	322	41	57
Offshore	18	40	58	71	29	35
East	34	44	78	171	5	6
West	428	877	1,305	1,395	15	47
North	11	17	28	38	9	0
Panhandle	15	40	55	12	3	2
Utah	8	5	13	29	6	9
Virginia	0	4	4	0	4	0
Washington	1	1	2	0	2	0
West Virginia	9	26	35	45	3	0
Wyoming	36	84	120	139	15	31
Total U.S.	**1,921**	**2,974**	**4,895**	**6,103**	**370**	**584**

On a per foot basis, the cost of drilling and equipping an average well in the U.S. increased by 9.6% in 1988, according to IPAA's cost study committee. Cost per well was up 15.2% due to greater emphasis on gas completions and deeper average depths.

Wildcat drilling has suffered along with total activity. In the case of natural gas, U.S. gas drilling has tilted sharply toward infill drilling during the last 10 years. That trend is likely to continue in the Lower 48.

Operators may recover large additional volumes of nonassociated gas onshore with today's technology by drilling more closely spaced wells in complex reservoirs.

U.S. highlights. Most areas of the U.S. will share in the cutback of drilling plans with only a smattering of exceptions.

Coalbed gas development in Alabama, for example, has caused a big increase in drilling plans for that area. The industry plans 735 wells to be completed in the state this year.

But there are big declines in the major oil states. California operators plan only 1,408 wells this year; there will be 700 completions in Colorado. Drilling in the Illinois basin is low with 950 wells for Illinois, 80 for Indiana, and 1,900 for Kentucky.

Louisiana operators plan only 2,062 wells in 1989, 610 of these in southern parishes and 752 offshore, one of the bright drilling arenas in the U.S.

Exploration and development of both deep and shallow zones continues to keep Michigan operators in business with 650 wells planned this year. New Mexico, always an active area, can expect only about 1,055 wells to be drilled in 1989.

Oklahoma, one of the more mature onshore U.S. areas, suddenly is back in the news as an oil and gas province of renewed productive value. Drilling in Cambro-Ordovician Arbuckle limestone in three areas has thrust the state back onto the exploratory stage in a big way. The industry plans 3,200 wells in Oklahoma this year.

The successful new areas are Cottonwood Creek field in the Ardmore-Marietta basin, Carter County; ARCO's Wilburton field gas zone discovery in the Arkoma basin, Latimer County; and Northeast Mayfield field in the Anadarko basin, Beckham County.

There have also been some deep and prolific gas discoveries in the Arkoma basin with Wapanucka and Red Oak Pennsylvanian pays.

Eastern plans call for 250 wells in New York, 500 in Pennsylvania, and 600 in West Virginia.

Texas operators see a low year for well work with 8,560 total completions planned. Of interest to many is the 200 planned for offshore Texas waters.

Rocky Mountain operators aren't happy with the outlook for 1989 with 700 wells for Colorado, 190 for Montana, 140 for western Nebraska, 140 for North Dakota, 7 for South Dakota, 100 for Utah, and 650 for Wyoming.

Majors plan less action. The major companies will drill 4,895 wells in the U.S. this year, compared to 6,103 in 1988. Their wildcatting plans are also hurt by times with only 370 planned this year by the top 14 companies.

Majors do plan to drill more wells during the second half than they did during the first 6 months of the year.

Major companies will drill 387

OGJ's revised drilling forecast for 1989—U.S. and Canada

State district, province	First half estimates				1989 forecast			
	Total comp.	Wildcats	Field wells	Total ft (1,000)	Total comp.	Total wildcats	Field wells	Total ft (1,000)
Alabama	418	46	372	1,191	735	75	660	2,095
Alaska	82	12	70	823	151	15	136	1,516
Arizona	1	1	0	3	5	5	0	20
Arkansas	161	18	143	722	290	40	250	1,301
California	628	56	572	1,695	1,408	108	1,300	3,802
Colorado	390	150	240	2,435	700	280	420	4,370
Florida	7	3	4	108	11	6	5	167
Illinois	370	150	220	783	950	350	600	2,011
Indiana	47	20	27	75	80	30	50	128
Iowa	6	6	0	7	6	6	6	7
Kansas	977	424	553	3,160	2,300	700	1,600	7,438
Kentucky	914	235	679	1,645	1,900	350	1,550	3,420
Louisiana	874	185	689	7,396	2,062	497	1,565	17,682
North	310	50	260	1,517	700	102	598	3,426
South	230	35	195	2,538	610	125	485	6,733
Offshore	334	100	234	3,341	752	270	482	7,523
Michigan	317	72	245	1,081	650	180	470	2,217
Mississippi	128	57	71	1,111	300	120	180	2,604
Missouri	5	5	0	16	10	10	0	32
Montana	76	40	36	304	190	75	115	760
Nebraska	56	35	21	300	140	65	75	750
Nevada	4	3	1	22	9	8	1	49
New Mexico	419	30	389	2,237	1,055	55	1,000	5,632
New York	155	4	151	569	250	15	235	646
North Dakota	70	32	38	567	140	65	75	1,134
Ohio	554	18	536	2,300	900	40	860	3,736
Oklahoma	907	69	838	4,793	3,200	140	3,060	16,909
Oregon	2	2	0	7	4	4	0	14
Pennsylvania	463	34	429	2,070	500	40	460	2,100
South Dakota	5	3	2	32	7	4	3	45
Tennessee	28	3	25	42	60	10	50	90
Texas	3,894	853	3,041	22,099	8,560	1,765	6,795	47,860
District 1	341	48	293	1,150	650	120	530	2,193
District 2	193	78	115	1,309	500	200	300	3,262
District 3	316	123	193	2,275	520	200	320	3,743
District 4	355	95	260	2,892	750	150	600	6,110
District 5	77	28	49	493	180	65	115	1,152
District 6	260	44	216	2,026	400	100	300	2,520
District 7-B	601	104	497	1,878	1,200	200	1,000	3,748
District 7-C	306	78	228	1,729	610	120	490	3,085
District 8	542	50	492	3,426	1,900	110	1,790	12,011
District 8-A	235	55	180	1,275	400	125	275	2,170
District 9	434	100	334	1,776	900	210	690	3,684
District 10	151	18	133	1,038	350	40	310	2,100
Offshore	83	32	51	832	200	125	75	2,082
Utah	45	16	29	238	100	20	80	500
Virginia	5	1	4	21	9	5	4	38
Washington	2	2	0	26	3	3	0	40
West Virginia	311	3	308	1,224	600	15	585	2,400
Wyoming	277	92	185	1,902	650	190	460	4,464
Total U.S.	[illegible]	[illegible]	9,918	[illegible]	27,935	5,291	22,644	138,977
Western Canada	2,781	1,032	1,720	10,972	5,918	1,982	3,936	23,448
Alberta	2,000	790	1,210	8,370	4,500	1,500	3,000	18,832
Saskatchewan	600	205	395	1,705	1,200	400	800	3,412
British Columbia	150	30	120	856	190	60	130	1,084
Manitoba	8	4	4	22	16	10	6	43
North-Arctic	3	3	0	19	12	12	0	77
East Coast Offshore	3	2	1	31	5	4	1	56

wells in Alabama, 151 in Alaska, 1,044 in California, 119 in Colorado, 88 in Illinois, and 143 in Kansas. They plan 505 wells in Louisiana, always "major country". The deep and shallow gas program in Michigan will attract the majors who plan 65 wells this year.

New Mexico is a popular spot for the big companies who plan 120 wells this year. And, Oklahoma can expect 230 wells to be drilled by the majors.

Most of the 1,694 wells planned in Texas by the 14 large companies in the Journal group will be drilled in western counties and along the Gulf Coast. There will be 58 wells drilled on offshore prospects and 78 in eastern counties where Jurassic and Cretaceous rocks lure the oil hunters.

Cretaceous Muddy and Pennsylvanian Minnelusa discoveries and development wells highlight action in Wyoming where the majors plan 120 wells this year.

Key plays proceed. The fast moving oil and gas plays of the early part of this decade are missing from many areas as operators strive for efficiency by concentrating on low risk exploration, development and intill work, and opening of behind-pipe zones.

Drilling outside U.S., Canada to drop 6%

Oil-price recovery has not yet been reflected in the pace of international drilling, but a turnaround is expected in the second half of this year.

Given continued strength in prices, the turnaround should carry over into 1990. But it won't come in time to prevent decline of 6% this year in rig activity outside the U.S. and Canada.

Thus, rather than the slight increase projected in January, when Oil & Gas Journal forecast 1,050 active rigs, current trends point to an average of 960 for the year compared to 1,023 in 1988. This is in close agreement with the latest forecast of 966 active rigs by Baker Hughes, which tracks drilling throughout the non-Communist world.

Gains in Asia Pacific, where private and national companies are aggressively pursuing exploration and development projects, will be more than offset by declines in Latin America and Africa. Europe and the Middle East, which held steady during the first 5 months of the year, should join Asia Pacific countries in the second half recovery.

Private companies continue to shift a larger percentage of drilling budgets to prospects outside North America. However, financial problems of a few governments and national oil companies will prevent higher prices from showing up in drilling budgets in some countries—notably those that don't welcome foreign capital.

Drilling outside the U.S. and Canada began a gradual slide last October, when oil prices plunged toward their recent lows. For the first 5 months, active rigs averaged 962, down 6.3% from the year before.

In May, drilling hit the lowest point of '80s recession. At 903, the rig count was off 123 rigs from the month a year ago and 594 from May 1982, the high point of the boom. But programs under way in Europe, Asia-Pacific, and Middle East should lift active rigs to an average around 960 the second half, in spite of problems in Africa and Latin America.

Latin America. Most of the year-to-year decline—80 rigs—took place in Latin America, and most of that was in Mexico, where a financial squeeze on Pemex cut active rigs from 156 in May 1988 to 90.

Prospects there are no better in the second half.

Brazil, where drilling was already off by seven rigs to 35, announced a 50% cut in the Petrobras budget, squeezed by price controls on refined products in the domestic market.

Thus, a further decline is in order until Petrobras gets back on its feet.

Argentina, the second most active driller in the region at 56 rigs in May, and Colombia, off five to 16, will be down for the full year, although both have larger programs planned.

These losses will more than offset the small gains posted by Venezuela, Ecuador, Bolivia, and Peru.

Africa. Algeria, down 42% to 19 rigs, is the main drag in Africa and is responsible for most of the region's 25-rig decline from a year ago.

Libya, managing to sustain drilling at year-ago levels, is working to lure more foreign capital to expand reserves and productive capacity, but efforts may not translate into drilling this year.

Nigeria is showing signs of life, under impetus of the Shell program, and Gabon should be up for the year also.

Asia- Pacific. Paced by India's 137 rigs, Asia-Pacific has replaced Latin America as the most active region in the non-Communist world outside North America.

With 287 rigs active in May, the region shows strength everywhere, particularly in Indonesia, Pakistan, Malaysia, Thailand, and Australia.

Improved terms have attracted increased private capital to this dynamic region, where countries are struggling to expand exports or reduce the drain of imports and achieve self sufficiency.

Middle East. This region was just 3 rigs off its year-ago pace in May, because of small declines in Abu Dhabi, Dubai, Egypt, and Turkey.

But increases in Iraq, Iran, Syria, and Oman should lift the Middle East in the second half. Iraq and Iran are working hard to restore and expand war-reduced productive capacity to pave the way for further increases in exports as OPEC captures a rising share of the world market.

Exploration interest is currently focused away from the mature producing areas of the Persian Gulf and toward lightly explored areas such as North and South Yemen and Oman. Egypt has succeeded in signing a large number of new exploration agreements, but operators, concerned about recovering investments, are approaching commitments with caution.

Europe. Declines in the U.K. and Norway, partly because of safety reviews, pulled drilling 6.5% below a year ago, but events in the U.K. sector of the North Sea point to a turnaround for Europe in the second half.

Drilling off Norway will continue to lag, but strong programs are under way in Holland, Italy, and Yugoslavia.•

Meridian Oil Inc. will nearly double to 27 the number of horizontal development wells it plans to drill in the Williston basin this year. Another operator has had success with development drilling as deep as 11,000 ft based on analysis of zones behind pipe in an old North Dakota well.

Unitization is being studied for what has been an intense Pennsylvanian Morrow oil play on the eastern high plains of Southeast Colorado. While gas and water injection plans advance, operators still try to define the meandering Morrow channel at the north end of a 15 mile long trend.

Low oil prices still stifle economics of deepwater oil exploration/development in the Gulf of Mexico.

One of the few hot areas on the map is the Jurassic Norphlet deep gas trend off Mississippi, Alabama, and Florida. Production is being doubled at Mary Ann field in Mobile Bay's mouth. Mobil also plans to move forward with development of significant Norphlet discoveries southwest of Mary Ann field. Other majors have also stepped up their development plans in the region.

And exploratory work also is picking up.

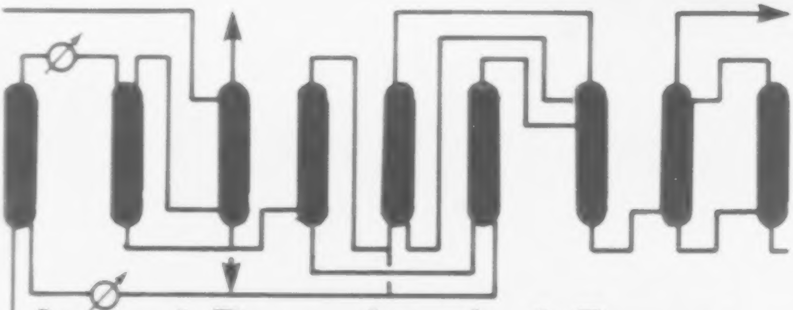
Activity in the San Juan basin of New Mexico is expected to rise partly because of a tax credit.

Operators plan to drill more than 1,000 wells by the end of next year to tap gas in Upper Cretaceous Fruitland coalbeds, where wells begun by the end of 1990 qualify through 2001 for a tax credit.

Amoco drilled more than 100 Fruitland coalbed wells last year and plans about as many this year, mostly in La Plata County, Colo. in the northern part of San Juan country. There are other companies in on this action, too.

In Wyoming's Green River province, Enron Oil & Gas Co. plans to double production from Big Piney field on the LaBarge platform to 60 MMcfd by drilling as many as 200 wells in 3-5 years. •

OGJ SPECIAL



Annual Petrochemical Report

About this issue...

Worldwide ethylene capacity shot up last year in response to solid demand for olefins derivatives. According to the Journal's exclusive survey of worldwide petrochemical plants, much of the capacity increase occurred in the U.S. But capacity-expansion plans indicate rapid growth will also occur in the Far East and Mid East regions. Details of existing and planned capacity are given in this special report, along with capacity and demand for benzene and styrene, two important petrochemicals on the world scene. Another article in this special section focuses on the Mid East.

Derivative demand pushes ethylene capacity up

Richard A. Corbett
Refining/Petrochemical Editor

Worldwide ethylene capacity grew more in 1988 than during any other year during the decade, in response to solid olefins derivatives demand, according to the Journal's latest survey of worldwide petrochemical facilities. Ethylene capacity soared 6.6% above last year's capacity.

High demand for olefins derivatives has boosted both demand and prices for basic olefins (ethylene and propylene) and has kept petrochemical facilities running at high utilization rates. Profitability is the best it has been during the decade.

The high demand, high plant utilization, and good profits have spurred numerous announcements for more ethylene capacity worldwide, particularly in the U.S., the Mid East, and the Far East.

Unfortunately, the bright picture in the petrochemical industry may dim some when these projects come on stream during the early 1990s.

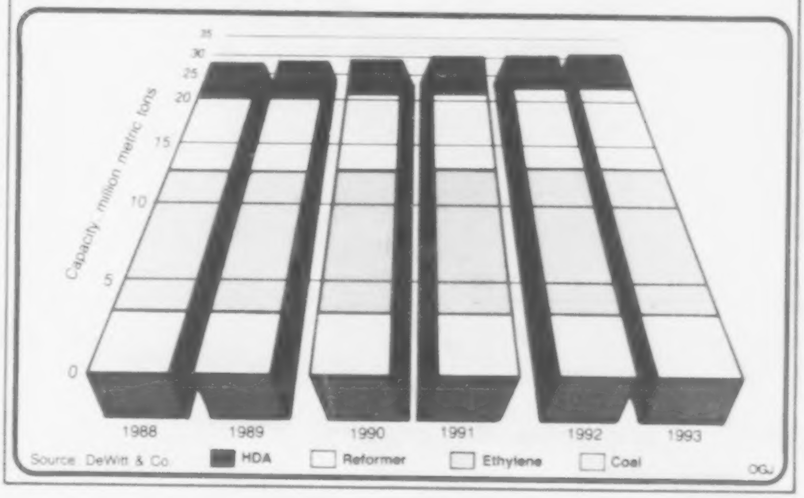
Derivative demand is also pushing demand for aromatics such as benzene. The benzene surplus is rapidly disappearing, resulting in the need for higher plant utilization rates and rising benzene prices.

One key derivative of both ethylene and benzene is styrene monomer. Its demand was up during 1988, forcing styrene plant utilization to 100% worldwide.

Ethylene capacity soars. Worldwide ethylene capacity soared to 51,972,000 metric tons/year as of June 1, 1989, from 48,766,000 metric tons/year as of June 1, 1988 (Table 1).

Fig. 1

Sources of benzene



Source: DeWitt & Co.

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Table 1

Ethylene capacity by country*

Area	1,000 metric tons/year 1987	1988	1989
North America			
U.S.	16,820	16,985	19,616
Canada	2,200	2,358	2,407
Total	**19,020**	**19,343**	**22,023**
Latin America			
Argentina	254	255	262
Bolivia	230	230	230
Brazil	1,461	1,502	1,573
Chile	60	60	60
Colombia	115	200	215
Mexico	932	932	932
Puerto Rico	413	413	413
Venezuela	150	150	150
Total	**3,615**	**3,742**	**3,835**
Western Europe			
Austria	320	320	320
Belgium	520	520	520
Finland	200	230	230
France	2,400	2,435	2,455
West Germany	3,790	3,790	3,790
Greece	15	15	15
Italy	1,485	1,845	1,845
The Netherlands	2,285	2,325	2,360
Norway	390	390	390
Portugal	300	300	300
Spain	966	966	980
Sweden	365	355	370
Switzerland	30	30	30
U.K.	1,845	1,945	1,975
Total	**14,911**	**15,466**	**15,580**
Asia/Pacific			
Australia	420	420	455
India	256	256	257
Japan	5,357	4,295	4,458
Korea	505	505	505
Singapore	300	300	300
Taiwan	953	953	953
Total	**7,791**	**6,729**	**6,928**
Other			
Algeria	364	364	364
Hungary	— —	250	250
Iran	26	26	26
Israel	130	130	130
Qatar	280	280	300
Saudi Arabia	1,611	1,611	1,611
South Africa	150	220	320
Syria	— —	250	250
Turkey	355	355	355
Total	**2,916**	**3,486**	**3,606**
World Total	**48,295**	**48,766**	**51,972**

*As of June 1, 1989.

All regions of the world scored capacity gains, with North America the highest with a gain of 2,680,000 metric tons/year—almost all of that in the U.S.

U.S. ethylene capacity jumped more than 15% to 19,616,000 metric tons/year from 16,985,000 metric tons/year last year. The U.S. now has 37.7% of the global ethylene capacity.

Much of the capacity gain in the U.S. was accomplished by increasing capacity of existing plants through debottlenecking and modernization projects. But a substantial boost in U.S. capacity, 1,830,000 metric tons/year, was a result of the restart of Dow Chemical Co.'s Midland, Mich., facilities.

The Asia-Pacific region and the Mid East also scored healthy 3% capacity gains over last year. The Asia-Pacific region boosted capacity to 6,928,000 metric tons/year from 6,729,000 last year, and Mid East capacity rose to 3,606,000 metric tons/year from 3,486,000 last year.

The capacity gain in the Mid East, although healthy, has not increased enough to threaten ethylene producers in other parts of the world, particularly Western Europe, as was thought during the mid-1980s, despite the region's large amounts of associated gas for olefins plant feed.

Western Europe, a region that suffered much excess capacity during the middle 1980s, boosted capacity to 15,580,000 metric tons/year from 15,466,000 last year. The gain in capacity was distributed evenly among the countries of the region.

Capacity to surge. Ethylene capacity will grow considerably in the U.S., the Mid East, and the Far East by 1993. Estimates indicate that worldwide capacity will reach more than 16,400,000 metric tons/year by the end of 1993.[1]

Announced capacity expansions in the U.S. will add about 6,900,000 metric tons/year to current capacity by 1993 if they all come on stream as scheduled (Table 3). Announced additions for the Far East and Mid East will boost capacity in those regions by about 9,600,000 metric tons/year by 1993.

Announced expansions in the U.S. amount to more than a 34% increase over current capacity. U.S. growth in ethylene demand is only expected to rise about 3.5% year. Obviously, excess capacity is likely during the early 1990s.

Ethylene demand, spurred by higher derivatives demand, will be better for the Far East with a demand growth of about 5%/year. But announced ethylene capacity expansions there total

Table 2

Installed ethylene capacity: 1989*

Company	Location	Capacity, 1,000 metric tons/year	Feed-stock†	Coproducts	Capacity, 1,000 metric tons/year§
U.S.					
Allied-Signal Inc. (with Union Texas Petroleum)	Geismar, La.	325	E,P	Propylene	21
				Butadiene	16
Amoco Chemicals Co.	Chocolate Bayou, Tex.	1,073	E,P,N	Propylene	445
				Butadiene	93
				Aromatics	82
B.F. Goodrich	Calvert City, Ky.	136	P	Propylene	90
Chevron Chemical Co.	Port Arthur, Tex.	386	NGL, R	Propylene	204
				Butadiene	22
	Baytown, Tex.	545	N, NGL, R	Propylene	295
				Butadiene	190
Cain Chemical Inc.	Corpus Christi, Tex.	770	LPG,N,G, Toluene	Propylene	275
				Butadiene	95
				Aromatics	250
	Alvin, Tex.	500	LPG,N,G, Toluene, Drip oil	Propylene	305
				Butadiene	60
				Aromatics	340
Dow Chemical	Freeport, Tex.	1,136	E,P,B,N	Propylene	250
				Butadiene	39
	Midland, Mich.	1,830	LPG,N	—	
	Plaquemine, La.	682	E,P,B,N	Propylene	75
Du Pont Petrochemical	Orange, Tex.	375	E,P	Propylene	—
				C_4	—
El Paso Products Co.	Odessa, Tex.	230	E	Propylene	100
Exxon Chemical U.S.A.	Baton Rouge, La.	590	E,P N,G	Propylene	400
				Butadiene	—
				Aromatics	—
	Baytown, Tex.	590	N,G	Propylene	408
				Butadiene	113
Fina Oil & Chem.	Groves, Tex.	9	R	Propylene	30
Lyondell Chemical Co.	Channelview, Tex.	1,270	E,P,N,G	Propylene	839
				Butadiene	216
				Aromatics	374
Mobil Chemical Co.	Beaumont, Tex.	499	NGL,N	Propylene	136
				Butadiene	27
				Aromatics	35
	Houston, Tex.	227	NGL,R	Propylene	82
Occidental Chemical Corp.	Lake Charles, La.	250	E,P	Propylene	85
				Butadiene	20
				Py gas	30
Phillips 66 Co.	Sweeney, Tex.	1,045	NGL	Propylene	254
Shell Chemical	Deer Park, Tex.	1,315	NGL,R	Propylene	485
				Butadiene	113
	Norco, La.	1,015	NGL,R	Propylene	635
				Butadiene	226
Sun-Olin Chemical Co.	Claymont, Del.	109	R	—	—
Sun Refining & Marketing Co.	Marcus Hook, Pa.	86	R	—	—
Texaco	Port Arthur, Tex.	550	NGL,N,G	Propylene	275
				Butadiene	51
	Port Neches, Tex.	160	E,P	Propylene	135
Texas Eastman Co.	Longview, Tex.	650	E,P	Propylene	300
				Aromatics & Py gas	67
				Fuel Oils	6
Union Carbide	Seadrift, Tex.	562	E,P	Propylene	46
				Butadiene	—
				Aromatics	—
	Taft, La.	500	LPG,N	Propylene	193
				Butadiene	—
				Aromatics	—
	Texas City, Tex.	702	LPG,N	Propylene	136
				Butadiene	—
				Aromatics	—
Quantum Chemical Corp.—USI Div.	Deer Park, Tex.	180	E	—	—
	Morris, Ill.	455	E,P,B	Propylene	110
				Butadiene	15
				Py gas	25
	Clinton, Iowa	365	E,P	Propylene	14
				Butadiene	17
				Py gas	24
				Fuels	124
	Tuscola, Ill.	182	E,P	—	—
Vista Chemical Co.	West Lake, La.	317	E	Propylene	8
				Butadiene	15
				Aromatics	8
U.S. total		**19,616**			
ALGERIA					
Sonatrach	Arzew	364	LNG	—	—
ARGENTINA					
Duperial S.A.I.C.	San Lorenzo	22	N,LPG		
				Py gas	2
Ipako	Ensenada	15	R	—	—
PASA Petroquimia Arg.	Pto. Gral San Martin	24	P	Butadiene	2
				Aromatics	3
				Fuel oils	2
Petroquimica Bahia Blanca	Bahia Blanca	201	E	C_3	6
				C_4	9
				Py gas	7
Argentina Total		**262**			
AUSTRALIA					
Altona Petrochem. Co. Ltd.	Altona, Victoria	170	E,G	Propylene	50
				Butadiene	17
Chemplex Australia Ltd.		35	E		—
ICI Australia	Botany, NSW	250	N,LPG	Propylene	95
				Butadiene	23
				Fuel oils	14
				Py gas	60
Australia total		**455**			
AUSTRIA					
OMV A.G.	Schwechat	320	B,N,G,R	Propylene	160
				Butadiene	50
BELGIUM					
Petrochem S.A.	Antwerp	520	N	Propylene	230
				Butadiene	65
				Aromatics	230
				Fuel oils	85
				Py gas	150
BOLIVIA					
Yacimientos Petroliferos Bolivianos	La Paz	230	E,P	Propylene	56
				Py gas	22
BRAZIL					
Brasiliera de Estireno	Cubatao	5	EtOH	—	—
Industrias Quimicas Electro Cloro	Santo Andre	11	EtOH	—	—
Copene Petroquimica	Camaracari-Bahia	460	N,G	Propylene	272
				Butadiene	79
				Py gas	420
				Aromatics	200
Copesul	Triunfo RS	561	N	Propylene	300
				Butadiene	96
				Py gas	215
				Aromatics	389
				Fuel oils	4
Coperbo	Cabo	36	EtOH	—	—
Petroquimica Uniao S.A.	Santo Andre	360	N	Propylene	204
				Py gas	103
				Butadiene	50
				Aromatics	325
Salgema Industrias Quimicas S.A.	Maceio-Alagoas	100	EtOH	—	—
Union Carbide	Cubatao	40	EtOH	—	—
Brazil total		**1,573**			
CANADA					
Alberta Gas Ethylene Co. Ltd.	Joffre, Alta.	1,457	E	Propylene	45
Dow Chemical	Sarnia, Ont.	50	P,B,R	Propylene	—
Imperial (Esso Chemical)	Sarnia, Ont.	220	NGL	Propylene	40
				Butadiene	8
				Py gas	25
Petromont	Varnenes, Que.	225	N	Propylene	—
Polysar Ltd.	Corunna (Sarnia), Ont.	455	E,N,G	Propylene	330
				Butadiene	91
				Aromatics	125
Canada total		**2,407**			
CHILE					
Petrox S.A.	Talcahuano	60	N	Py Gas	86
				Fuel Oils	9
COLOMBIA					
Empresa Colombiana	Barrancabermeja	115	E,R	Propylene	6
				Py gas	5
Poliolefinas Colombianas	Barrancabermeja	100	E,R	Py gas	2
				Py Gas	1
Colombia total		**215**			

Table 2 (continued)

Installed ethylene capacity: 1989* (continued)

Company	Location	Capacity, 1,000 metric tons/year	Feedstock†	Coproducts	Capacity, 1,000 metric tons/year‡
FINLAND					
Neste Oy	Porvoo	230	N,G, R,NGL	Propylene	170
				Butadiene	20
FRANCE					
Atochem	Lavera	260	E,N	Propylene	740
				Butadiene	50
				Butadiene	50
				Aromatics	50
	Feyzin	115	N, LPG	Propylene	60
				Butadiene	30
				Aromatics	30
	Gonfreville	390	N, LPG		
	Lacq	75	E	—	—
BP Chimie	Lavera	240	LPG,N	Propylene	155
				Butadiene	50
CdF Chimie	Charling & Lillebonner	420	N,G	Propylene	220
				Butadiene	130
				Py gas	55
				Aromatics	360
				Fuel oils	260
Copenor	Dunkerque	275	N,G,LPG	Propylene	120
				Butadiene	75
				Py gas	40
				Aromatics	170
				Fuel oils	175
Shell Chimie	Berre	380	N,G,LH		
Esso Chimie	Notre Dame de Gravenchon	300	N,R	Propylene	220
				Butadiene	70
				Py gas	310
France total		**2,455**			
GERMANY					
BASF A.G.	Ludwigshafen	450	N	Propylene	240
				C_4	150
				Py gas	360
Deutsche Marathon	Burghausen	280	N,R	Propylene	130
				Butadiene	90
				Fuel oil	2
Deutsche Texaco A.G.	Heide	80	N	Propylene	55
				C_4	28
Erdolchemie G.m.b.H.	Worringen	740	N	Propylene	520
				Butadiene	245
				Aromatics	200
Esso Chemie G.m.b.H.	Cologne	450	N	Propylene	240
				C_4	38
Huls AG	Marl	50	LPG	—	—
Rheinische Olefinwerke	Wesseling	650	N,G,P	Propylene	300
				Butadiene	150
				Py gas	520
Union Rheinische Braun-Kohlen Krafstoff A.G.	Wesseling	440	N,G,R LH	Propylene	260
				C_4	150
				Py gas	595
				Fuel oils	165
Ruhr Oel A.G.	Gelsenkirchen	400	N, LPG	Propylene	245
				Py gas	360
				Aromatics	90
	Munchmunster	200	N,LPG	Propylene	130
				Py Gas	150
Chemische Werke Huls	Marl	50	LPG	—	—
Germany total		**3,790**			
HUNGARY					
Tiszai Vegyi Kombinat	Leninvavos	250	N	Propylene	125
			C_4		80
				Py Gas	200
GREECE					
EKO Chemicals Co.	Thessaloniki	15	N	Py gas	10
INDIA					
Alkali & Chemical Corp.	Rishra, W. Bengal	12	EtOH	—	—
Chemicals & Plastics India	Mettudam	19	EtOH	—	—
McDowell & Co.	Visakhapatnam	3	EtOH	—	—
India Petrochem Corp.	Baroda	130	N	Propylene	81
				Butadiene	22
				Py gas	29
				Aromatics	20
National Organic Chemicals Industries Ltd.	Thane, Bombay	63	N	Propylene	37
				Butadiene	7
Polychem Ltd.	Bombay	3	EtOH	—	—
	Nira	4	EtOH	—	—
Union Carbide India Ltd.	Bombay	22	N	Propylene	6
				Benzene	3
				Aromatics	6
				Fuel oils	6
Synthetics & Chemicals Ltd.		4	Etoh	—	—
India total		**257**			
IRAN					
Abadan Petrochemical	Abadan	26	R	Propylene	15
ISRAEL					
Oil Ref. Ltd.	Haifa Bay	130	N,R,LPG	—	—
ITALY					
Enichem	Gela	310	E,N	Propylene	160
				Butadiene	40
				Py gas	280
				Aromatics	150
				Fuel oils	55
	Priolo	215	N	Propylene	150
	Bindisi	130	N	Propylene	85
				Butadiene	120
	Porto Tores	240	N	Propylene	121
				Butadiene	50
ICAM	Priolo	600	N,G	Propylene	350
Montedipe	Porto Marghera	350	N	Propylene	180
Italy total		**1,845**			
JAPAN					
Idemitsu Petrochem Co. Inc.	Tokuyama	380	N	Propylene	220
Maruzen Petrochem Co. Inc.	Goi	373	N	Propylene	220
				Butadiene	55
				Aromatics	240
Mitsubishi Petrochemical Co. Inc.	Kashima	387	N,LPG	—	—
	Yokkaichi	254	N,LPG	—	—
Mizushima-Ethylene	Mizushima	375	N,LPG	Propylene	216
Nippon Petrochemicals	Kawasaki	190	N,LPG	Aromatics	118
				Butadiene	60
Osaka Petrochemicals Inds.	Osaka	330	N,B	Propylene	220
				Aromatics	228
Sanyo Ethylene Co.	Mizushima	390	N	Propylene	254
Shin Daikyowa Petrochemical Co.	Yokkaichi	300	N	Propylene	156
				Butadiene	44
				Py gas	220
				Aromatics	124
Showa Denko, K.K.	Ohita	320	N,LPG	Propylene	170
				Butadiene	45
				Py Gas	160
				Fuel oils	67
Sumitomo Chem. Co. Ltd.	Chiba	358	N,LPG	Propylene	255
	Nihama	139	N	Propylene	123
Tonen Petrochemical Co. Ltd.	Kawasaki	350	N,LPG	Propylene	224
				Butadiene	105
Ukishima Petrochem Co. Ltd.	Ukishima & Chiba	312	N,LPG	Propylene	172
Japan total		**4,458**			
KOREA					
Daelim Industrial	Yeochun	350	N,G,LPG	Propylene	187
				Aromatics	148
Yukong Ltd. (formerly Korea Oil)	Ulsan	155	N	Propylene	81
				Butadiene	24
				Aromatics	70
				Fuel oils	18
Korea total		**505**		Py gas	128
MEXICO					
Petroleos Mexicanos	Cangrejera	500		Propylene	27
	Pajaritos	209	E		
	Poza Rica	182	E	Propylene	9
	Reynosa	27	LH		
	Ciudad Madero	14	R		
Mexico total		**932**			
THE NETHERLANDS					
Dow Chemical Europe	Terneuzan	960	N	Propylene	450
				Benzene	600
				Butadiene	150
DSM	Limburg	850	N,G,LPG	Propylene	470
				Butadiene	110
Shell Nederland Chemie BV	Moerdijk	550	N,G,LPG	Propylene	300
				Butadiene	115
Netherlands total		**2,360**		Py gas	525

Installed ethylene capacity: 1989* (continued)

Table 2 (continued)

Company	Location	Capacity, 1,000 metric tons/year	Feedstock†	Coproducts	Capacity, 1,000 metric tons/year§
NORWAY					
I/S Noretyl	Rafnes	390	NGL	Propylene	70
PORTUGAL					
Companhia Nacional de Peroquimica	Sines	300	LPG,N	Propylene	150
				Butadiene	40
				Py gas	220
				Fuel oils	36
PUERTO RICO					
Union Carbide Caribe Inc.	Ponce	413	N,LPG	Propylene	227
QATAR					
Qatar Petrochemical	Umm Said	300	E	Propylene	6
				Butadiene	5
				Py gas	15
SAUDI ARABIA					
Saudi Petrochemical Co.	Al-Jubail	656	E	—	—
Arabian Petrochemical Co.	Al-Jubail	500	E	—	—
Saudi Yanbu Petrochem. Co.	Yanbu	455	E	—	—
Saudi Arabia total		1,611			
SINGAPORE					
Singapore Petro-Chemical	Singapore	300	LPG,N	Propylene	—
SOUTH AFRICA					
Sasol Ltd.	Sasolburg	320	Syn. gas		
SPAIN					
Dow	Tarragona	350	N	Propylene	130
				Butadiene	50
				Py gas	300
Reosol Petroleo S.A.	Puertollano	240	N,R	Propylene	180
	Tarragona	390	LPG,N	Propylene	180
Spain total		**980**			
SWEDEN					
Statoil Petrochemie A/B	Stenungsund	370	N,P	Propylene	180
				Py gas	130
				Fuel oils	40
SWITZERLAND					
Lonza, A.G.	Visp	30	N,LPG	Acetylene	
SYRIA					
General Fertilizer	Katteneh	250	E	—	—
TAIWAN					
Chinese Petro. Corp.	Koahsiung	899	N,G	Propylene	477
				Butadiene	128
China Petrochemical Development Corp.	Toufen	54	E	—	—
Taiwan total		**953**			
TURKEY					
Yarpet Yarimea Petrokimya A.S.	Izmit	55	N	Propylene	40
				Py gas	6
				Fuel oils	7
	Izmir	300	N	Propylene	138
				C_4	80
				Py gas	250
				Fuel oils	38
Turkey total		**355**			
UNITED KINGDOM					
BP Chemicals	Baglan Bay	350	N	Propylene	200
				Butadiene	60
	Grangemouth	270		Propylene	180
				Butadiene	48
ICI/BP	Wilton	750	N,P	Propylene	350
				Butadiene	90
Exxon Chemical Olefins Inc.	Fawley	105	N,G	Propylene	100
				Butadiene	80
	Fife	500	E		
U.K. total		1,975			
VENEZUELA					
Pequiven	El Tablazo	150	E,P	Propylene	35
WORLD TOTAL					
*(As of June 1, 1989)		**51,972**			

†Key: E = ethane, P = propane, B = butane, R = refinery streams, N = naphtha, G = gas oil, LH = light hydrocarbons, NGL = natural gas liquids (ethane, propane, butane), LPG = liquefied petroleum gas (propane, butane), EtOH = ethanol.
§ Coproduct production is only estimated or design quality. Actual production can vary widely depending on feedstock slate, severity, etc.

more than 4,200,000 metric tons/year by 1993, meaning that some over capacity will exist in the Far East also.

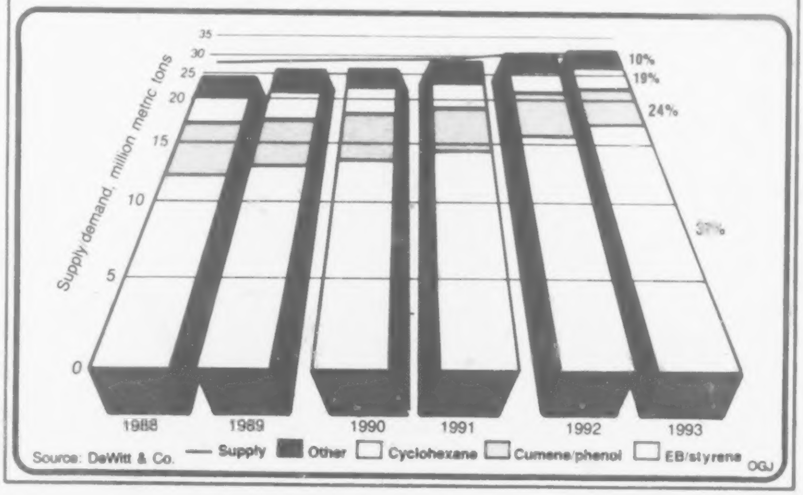
As derivatives production capability in the Far East increases, derivative exports from the U.S. will likely decline. Lower U.S. exports could further exacerbate an ethylene over-capacity situation because the U.S. does not currently export ethylene, only its derivatives.

There is some optimism shown by U.S. ethylene producers, however. Some have said that many of the announced projects may not be completed on time because of longer plant equipment lead times and busy fabricating facilities. And as the 1990s approach, some producers may scale down expansion plans.

If some of the announced expansions are delayed as little as 2 years, and if capacity is less than an-

Where benzene goes

Fig. 2



Source: DeWitt & Co.

Table 3

Some of the major ethylene projects planned

Company	Capacity expansion 1,000 metric tons/year	Estimated start date
U.S.		
Amoco Chemical Co.	680.3	1993
Cain Chemical Co.	453.5	1993
Chevron Chemical Co.	90.7	1989
Dow Chemical Co.	680.3	1992
Exxon Chemical Co.	453.5	1990
Formosa Plastics Group	680.3	1992
Lyondell Petrochemical Co.	272.1	1989
Mobil Chemical Co.	453.5	--
Phillips 66 Co.	680.3	1991
Quantum Chemical Corp.	680.3	1991
Shell Chemical Co.	453.5	1991
Texaco Chemical Co.*	181.4	1989
Union Carbide Corp.*	226.8	1989
Union Texas Petroleum Corp.	181.4	1990
Vista Chemical Co.	181.4	1990
Westlake Petrochemicals Corp.	453.5	1991
Total estimated U.S. additions	**8,802.8**	
SOUTH KOREA		
Daelim	300.0	1989
Yukong	400.0	1989
Lucky	350.0	1992
Others (6)	1,300.0	1995
TAIWAN		
China Petroleum	400.0	1992
Formosa Plastics	400.0	?
THAILAND		
Thai National Petrochemical Co.	315.0	1990
Thai National Petrochemical Co.	315.0	1995
JAPAN		
Restarts	445.0	1992
New cracker	400.0	1993
INDIA		
Nagothane	300.0	1990
Madras	300.0	1991
INDONESIA		
Several studies	300.0	1993
MAYLASIA		
Several contenders	300.0	1993
CHINA		
Shanghai	300.0	1990
AUSTRALIA		
Petrochem Ind. Ltd.	145.0	1991
EGYPT		
Egyptian Petrochemical Co.	200.0	1991
IRAN		
National Petrochemical Co.	490.0	1993
IRAQ		
Iraq Petrochemical Co.	600.0	1993
KUWAIT		
Kuwait Petrochemical Co.	285.0	?
NIGERIA		
Element Petrochemical Co.	400.00	1992
SAUDI ARABIA		
Sabic/Shell	300.0	1990
Petrokemya	500.0	1993
Sabic/Mobil	500.0	1993
Total Far East and Mid East	**9,545.0**	

*Restarts of existing facilities.
Source: DeWitt & Co. Current as of June 1, 1989.

nounced, ethylene demand could rise enough to ease any excess capacity, according to some producers. In any event, the bright conditions in the petrochemical industry may likely dim by the early 1990s.

Benzene surplus dwindling. Olefins and aromatics derivatives demand is causing heavier demand for benzene. As a result, surplus benzene capacity is beginning to disappear rapidly.[2]

Benzene is produced primarily in hydrodealkylation (HDA) units, disproportionation units, catalytic reformers, ethylene furnaces, and from coal-processing facilities (Fig. 1). The petrochemical sources, HDA and disproportionation units, reformers, and ethylene plants, account for almost all of the benzene produced worldwide.

Nameplate capacity to produce benzene from all sources was about 27.6 million metric tons/year in 1988 and is expected to grow to about 30.9 millon metric tons/year by 1993.[2] But all of the nameplate capacity cannot be utilized for benzene production because of the characteristics of the feedstocks processed in reformers and ethylene furnaces and because of utilization rates achieved in HDA units.

These constraints result in current actual benzene production capacity at about 75-80% of nameplate capacity, or about 23 million metric tons/year globally. Benzene demand was estimated at about 24 million metric tons/year in 1988.[2] That is expected to grow to about 31 million metric tons/year by 1993.

A major derivative of benzene is ethylbenzene, the basic component of styrene monomer. Other uses include cumene and phenol production, cyclohexane production, and other widely varying uses.

Ethylbenzene consumed about 12 million metric tons/year of benzene, cumene/phenol about 4.5 million metric tons/year, cyclohexane about 4 million metric tons, and other uses about 3.5 million metric tons/year (Fig. 2). These uses equaled, or slightly exceeded, actual benzene production capacity during 1988.

Global demand for ethylbenzene/styrene monomer is expected to grow by 37% by 1993, cumene/phenol by 24%, cyclohexane by 19%, and other uses by about 10%.[2]

U.S. benzene demand in 1988 was about 8.9 million metric tons/year. Capacity was slightly more at about 10 million metric tons/year (Fig. 3).[2] U.S. demand is expected to grow to about 11.7 million metric tons by 1993, compared to an expected benzene capacity of about 11 million metric tons/year.

Styrene monomer. Styrene monomer has become one of the most

Table 4

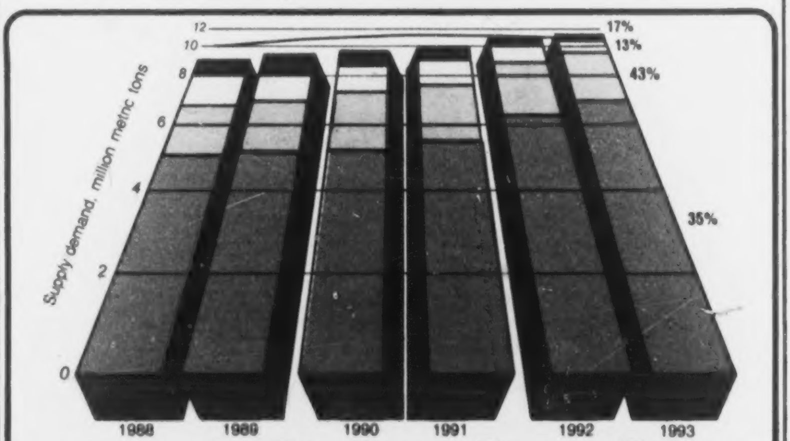
Estimated world styrene capacity, 1989

Producer	Estimated capacity 1,000 metric tons/year
U.S.	
Amoco Chemical Co., Texas City, Tex.	345
ARCO, Channelview, Tex.	630
ARCO, Kobuta, Pa.	100
Chevron Chemical Co., Donaldsonville, La.	270
Cosmar Chemicals, Carville, La.	680
Dow Chemical Co., Freeport, Tex.	590
El Paso Products Co., Odessa, Tex.	145
Huntsman Petrochemical Co., Bayport, Tex.	450
Sterling Chemical Co., Texas City, Tex.	680
Total U.S.	**3,890**
CANADA	
Dow Chemical Canada Inc., Sarnia, Ont.	65
Polysar Ltd., Sarnia, Ont.	365
Shell Canada Ltd., Scotford, Alta.	360
Total Canada	**790**
WESTERN EUROPE	
Atochem, Gonfreville, France	250
Atochem, Lacq, France	25
BP Chemicals Ltd., Baglan Bay, U.K.	220
BASF AG, Ludwigshafen, West Germany	500
BASF AG, Wesseling, West Germany	380
Dow Chemical (Nederland) BV, Terneuzen, The Netherlands	770
Enimont, Ravenna, Italy	45
Enimont, Mantua, Italy	280
Hüls, Marl, West Germany	250
Norsolor, Carling, West Germany	300
Repsol, Puertollano, Spain	110
Shell Nederland Chemie BV, Moerdijk, The Netherlands	320
Total Western Europe	**3,450**
OTHER REGIONS	
Japan	1,785
Taiwan	340
Korea	230
China	200
Latin America	560
Others	1,805
Total other regions	**4,920**
Total world	**13,050**

Source: BASF AG and Grand Pacific Petrochemical Corp., June 1, 1989.

Fig. 3

U.S. benzene capacity/demand



Source: DeWitt & Co.

important petrochemical derivatives during the last 2 years. Its price has firmed, and its demand is up.[3]

Total global styrene monomer capacity by mid-1989 was estimated at about 13,050,000 metric tons/year (Table 4). The U.S. and Western Europe were at about equal capacity, with U.S. capacity at about 3,890,000 metric tons/year, and Western Europe capacity at about 3,450,000 metric tons/year.

Japan, with 1988 capacity at about 1,785,000 metric tons/year, ranks third.

Strong demand has resulted in high styrene plant utilization rates throughout the world. Plants are running at 100% worldwide.[3]

U.S. demand ran at about 3.9 million metric tons/year in 1988, with plants running at about 97% utilization.

Western European plants were running at about 102% utilization during 1988 to meet the region's styrene demand of about 3.45 million metric tons/year.

Demand in Japan ran about 1.6 million metric tons/year during 1988. Styrene plant utilization rates there ran at about 95.2%.

Global styrene demand is expected to rise 3%/year to 1993 when demand is expected to be about 14.1 million metric tons/year.[3] But global capacity increases of about 6.4%/year by then will raise capacity to about 17 million metric tons/year.

As a result, utilization rates will begin to fall slightly from 98.7% in late 1989, to about 82.8% in 1993.

The highest increases in demand will occur in the far East. The lowest increases will occur in the U.S. and Western Europe.

About 700,000 metric tons of styrene monomer were exported to the Far East in 1988.[3] Although this is expected to drop to about 550,000 metric tons in 1992, the region will still be a hot export market.

The U.S. and Canada will continue to produce a large surplus of styrene monomer where about 300,000 metric tons from each country will find its way into export markets in the Far East.[1] Canada will likely increase exports to the U.S. as a result of the recent relaxed trade policies with the U.S.

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OGJ international refining-catalyst compilation—1989

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft,* g/cc	Carrier, support	Active agents	Availability
Catalytic naphtha reforming catalysts								
CHEVRON RESEARCH CO.								
Rheniforming Type F	Latest version, long cycle life stable product yields	Napthas, SR & cracked coal naphthas	Gas & BTX	Cyl.	40	"P"	Pt/Re	Contact Chevron
Type F	More stab. than F, higher sever. operations		"	"	"	"	"	
CRITERION CATALYSTS CO. LP								
AEROFORM PHF-5 & 5A	Monometallic, differing particle size	Naphtha	Gaso. or BTX	Cyl.	42	Al_2O_3	"P"	x
PRHF – 30 PRHF – 37 PRHF – 50 PRHF – 58	Bimetallic, different amounts of active metals	Naphtha	Gaso. or BTX	Cyl.	"P"	"	"P"	L
KX-120, KX-130, KX-160	(See Exxon Research & Engineering listings)							
TRILOBE KX-130	(See Exxon Research & Engineering listing)							
AEROFORM PHF-4 & 4A	Monometallic, Diff. particle sizes	Naphtha	Gaso. or BTX	Cyl.	42	Al_2O_3	PtCl	x
TRILOBE P-8 & P-8A	Monometallic, high particle Density, diff. sizes	Naphtha	"	Sh. xt.	44	"	"	x
AEROFORM PR-6 & 6A	Bimetallic, diff. part. sizes	Naphtha	"	Cyl.	42	"	Pt/ReCl	x
TRILOVE PR-8, 8A & 8E	Bimetallic, high part. dens., diff. part. sizes	Naphtha	"	Sh. ext.	44	"	"	x
TRILOBE PR-18 & 18A	Bimetallic, high part. dens., shaped skewed metals levels, diff. part. sizes	Low sulfur naphtha	"	"	44	"	"	x
IMP-RNA-2	(See Instituto Mexicano del Petroleo listing)							
CYANAMID KETJEN								
CK-303	All monometallics, diff. active metal contents	Naphtha	Gaso. or BTX	Cyl.	40	Al_2O_3	PtCl	x
CK-304		"	"		"	"	"	x
CK-305	"	"	"		"	"	"	x
CK-306	"	"	"		"	"	"	x
CK-433	Bimetallic	Naphtha	"	"	44	"	Pt/ReCl	x
CK-522 TRILOBE	Bimetallic, high part. dens.	Naphtha	"	Sh. ext.	44	"	"	x
CK-542 TRILOBE	High Re, high part. dens. shaped catalyst	Low sulfur naphtha	"	"	45	"	"	x
PHRF-30	Multimetallic	Naphtha	"	Cyl.	"P"	"	"P"	L
CK-473	High-Re catalyst	Naphtha	"	"	44	"	Pt/ReCl	x
KX-120, 120T, 130, 130T, 160, 160T	(See Exxon Research & Engineering catalystic reforming listing)							L
ENGELHARD CORP.								
E-301	Moderate stability	Naphthas, S < 5 ppmw	Gaso. or Aro.	Cyl.	45	Al203	Pt	x
E-302	More stable than E-301	Naphthas, S < 10 ppmw	"	"	45	"	"	x

(Continued)

Abbreviations for catalyst compilation

ABD—Apparent bulk density
AGO—Atmospheric gas oil
ARO.—Aromatic or aromatics
BTX—Benzene, toluene, xylenes (aromatics)
Cet.—Cetane
CGO—Coker gas oil
Cyl.—Cylinder
DAO—Deasphalted oil
Dist.—Distillate or distillates
DMO—Demetallized oil
DO—Diesel oil
Ext.—Extrudate
FCC—Fluid catalytic cracking or FCC unit
GO—Gas oil
Gaso.—Gasoline
HAGO—Heavy atmospheric gas oil
HC—Hydrocracking or hydrocracked
HDM—Hydrodemetallization
HDN—Hydrodenitrogenation
HDS—Hydrodesulfurization
HDT—Hydrotreating or hydrotreated
HFO—Heavy fuel oil
HGO—Heavy gas oil
HSFO—High sulfur fuel oil
HVGO—Heavy vacuum gas oil
Jet.—Jet fuel
Kero.—Kerosine
LCO—Light cycle oil
LGO—Light gas oil
LSFO—Low sulfur fuel oil
LSR—Light straight run
MHC—Mild hydrocracking
MS—Microsphere
Oct.—Octane
'P'—Proprietary
Prom.—Promoted or promoter
RE—Rare earth
RDS—Residual desulfurization
SA—surface area
SR—straight run
Stab.—stable or stability
Sph.—Sphere
Sh. ext.—Shaped extrudate
VGO—Vacuum gas oil
Zeo.—Zeolite
x—Unrestricted availability
L—Available under license only

Catalytic naphtha reforming—continued

Catalyst designation	Primary differentiation characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft,* g/cc	Carrier, support	Active agents	Availability
E-311	Maximize LPG production	Naphthas, S < 5 ppmw	LPG gaso.	Cyl.	45	"	"	x
E-601	High stability	Naphthas, S < 1 ppmw	Gaso. or Aro.	"	45	"	Pt, Re	x
E-603	High stab.,lower metal load	Naphtha, S < 1 ppmw	"	"	45	"	"	x
E-611	Very high stability	Naphtha, S = 0.1 ppmw	"	"	45	"	"	x
(Note: Preceding catalysts available in higher density at 49.5 lb/cu ft. They are designated HD, i.e. E-301HD)								
E-801	Stab. of E-603 at higher act.	Napatha S <1 ppmw	Gaso. or Aro.	Cyl.	51	Al203	Pt/Re	x
E-802	Stab. of E-611 at higher act.	Naphtha, S < 0.5 ppmw	"	"	51	"	"	x
E-803	Stab. of E-611 at higher act. opt. metals loading		"	"	51	"	"	x
E-804	Stab. & Act. of E-801, opt. metals loading	"	"	"	51	"	"	x
EXXON RESEARCH & ENGINEERING CO.								
KX-120	Multimetallic semiregen. or cyclic units; diff. promotor	Virgin/cracked naphthas	High oct. gaso & Aro.				Pt, etc.	L
KX-130	"							
KX-160	"	"	"					
INSTITUTO MEXICANO DEL PETROLEO								
IMP-RNA-1	High activity bimetallic	Desulfurized naphtha, aro. production	BTX high oct. gaso.	Cyl.	0.70*	Al_2O_3	Pt/Re	L
IMP-RNA-2 TRILOBE	"	"	"	Ext.	0.70*	"	"	L
KATALYSATORENWERKE HÜLS GmbH								
H-2440		Fraction 35-195 °C.	Gaso. or BTX	Cyl. exts.	0.8*	Al_2O_3	Pt, 0.3-0.8% monometallic	x
H-6413		"	"	"	0.6*	"	"	x
H-2462		"	"	"	0.6*	"	Pt, 0.3-0.8% + "P"	x
PROCATALYSE								
RG-412	H.P. reformer	Naphtha	Gaso.	Cyl.		Al_2O_3	Pt 0.35%	x
RG-482	M.P. & L.P. reformer	"	Gaso.	"	"	"	Pt 0.3% + Re	x
RG-492	"	"	Gaso.	"	"	"	Pt/Re	x
RG-442	Reformer	"	Gaso. & LPG	"	"	"	PT + IR + promoter	
CR-201	Cont. regen. reformer	"	Gaso.	Sph.	"	"	PtSN	x
AR-401	Cont. regen. reformer (Aromizing-IFP)	"	Aro.	"	"	"	Pt/promotor	L
AR-403	"	"	Aro.	"	"	"	"	L
AR-405	CCR (IFP aromizing)	"	"	"	"	"	"	x
MD-101	Sulfur removal	"	Naphtha	"	"	"		x
UOP								
R-11#	Higher act. monometallic	Semi-regen. or swing	Gaso. aro.	Sph.	32	Al_2O_3	Pt	Contact UOP
R-12#	Monometallic, higher stab. than R-11	Semi-regen.	"	"	32	"	Pt	"
R-55#	Monometallic, higher stab. than R-12,	Semi-regen. or swing	"	Ext.	Dense loaded 52	"	"	"
R-15#	Monometallic	Semi-regen.	LPG, Gaso.	Sph.	32	SiO_2/Al_2O_3	"	"
R-16H#	Bimetallic, higher stab. than monometallics	High severity, semi-regen.	Gaso. Aro.	"	32	Al_2O_3	Pt/Re	"
R-16F#	Bimetallic, low Pt, higher stab. than monometallics,	High severity, semi-regen.	"	"	32	"	"	"
R16G#	Bimetallic, higher act. & stab. than -16F & H,	" semi-regen.	"	"	32	"	"	"
R-18#	Bimetallic, higher act. & stab. than R-16 series,	" semi-regen.	"	"	37	"	"	"
R-22#	Bimetallic, higher yields, reduced state	CCR or semi, regen.	Higher pro. of oct. bbl & aero.	"	32	"	"P"	"
R-30	"	CCR or swing	"	"	35	"	"P"	"
R-32	"	CCR	"	"	35	"	"P"	"
R-50#	Bimetallic, higher act. & stab. than R-16 series,	High severity, semi-regen.	Gaso. or Aro.	Ext.	Dense loaded 52	"	Pt/Re	"
R-51	"	"	"	"	43	"	"	"
R-60#	Bimetallic, higher stab. than R-50, high act.	"	"	Sph.	45	"	"	"
R-62	Bimetallic, Lower Pt than R-60, higher stab. than R-50 high act.	"	"	"	44	"	"	"

†Reduced and sulfided.

Dimerization catalysts

KALI-CHEMIE AG								
Beadcat PK Series	Mechanical and thermal stab.	C_3/C_4 olefins	Gaso.	Bead	0.80*	SiO_2/Al_2O_3	Acid sites Al_2O_3	x
PROCATALYSE								
LC 1252		Propylene/ butylene	Gaso., hexenes, octenes	Liquid			Ni	L

(Continued)

Dimerization catalysts—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft,* g/cc	Carrier, support	Active agents	Availability

Isomerization C_4 catalysts

BP								
BP Isom	High activity, regenerable			Cyl.		Al_2O_3	PtCl	L
UOP INC.								
I-8	Higher activity for n-butane isom to iso-butane			Ext.	48	Al_2O_3	Pt	Contact UOP
ENGELHARD CORP.								
RD-290C	Regenerable, high act.			Cyl.	48	"	PtCl	L
HPN-IVB	Select. hydrog. trace butadiene, isom butene to butene 2	C_3, C_4	Dimersol, alky feed	Sph.	47	"P"	"P"	L

Isomerization (C_5 & C_6) catalysts

BP								
BP Isom	High act., L.P. operation, regenerable	C_5, C_6 fractions		Cyl.		Al_2O_3	PtCl	L
ENGELHARD CORP.								
RD-290C	Regenerable, high activity	C_5, C_6 paraffins		Cyl.	48	"	"	L
PROCATALYSE								
IS-632	Non-chlorinated, high act.	C_5/C_6 paraffins	High oct. gaso. or isomers	Ext.	0.50*	Special	Pt	x
UOP								
I-7	High act., sulfur & water tolerant	SR or HDT C_5/C_6 streams		Ext.	36	"P"	Pt	Contact UOP
I-8	High act., L.P. application	"		Cyl.	48	Al_2O_3	"	"
HS-10	Non-chloride activated, high tolerance for feed impurities	C_5/C_6 isom.	Octane upgrade	Cyl.	46	Mol sieve Al_2O_3	Pt	L

Isomerization (xylenes) catalysts

ENGELHARD CORP.								
0-750	Xylene isom.	C_8 aromatics	p. o-xylene	Cyl.	"P"	"P"	Pt	L
KALI-CHEMIE AG								
Beadcat PK series	Xylenes isom.	xylenes	p. o-xylene	Bead	0.80*	SiO_2/Al_2O_3	Acid sites	x
UOP								
I-9	High act. & high select.	Mixed xylenes, ethylbenzene	p. o-xylene	Sph.	37	"P"	"P"	Contact UOP

Fluid catalytic cracking catalysts

AKZO CHEMIE/AKZO CHEMIE AMERICA/KETJEN CATALYSTS								
Multicrack 20/200	High liq. yields, good oct.	GOs, clean resids	Max. gaso., bott. upgrade	MS	0.70-0.80*	Act. matrix	Zeo.	x
Multicrack 50/500	"	"	Max. gao.,	"	"	"	"	x
Multicrack + 20/200	High oct., good liq. yields	"	Max. oct. bbl, bot. upgr.	"	"	"	"	x
Multicrack 50/500	"	"	Max. oct. bbl,	"	"	"	"	x
Octaboost 600/610	Max. RON, Bot. upgrading	GOs, resids	Max. oct., bottoms upgrading	MS	0.70-0.80*	Adv. cat. system	USY zeo	x
Octaboost 600/160 G	Max. Ron/Ni resist/enhanced macroporosity	" + high metals feeds	Max. oct., low coke, gas, max. Ni resist.	"	"	"	"	x
Octaboost 620	Max. MON	Gos, resids	Max. oct., max. branching, low coke gas	"	"	Act. matrix	ADZ 25 zeo.	x x
Octaboost 620 G	Max. MON, low coke, gas	" + high metals feeds	"	"	"	Adv. cat.	"	x
Octaboost 620 S	Max. MON, Ni resist., enhanced macroporosity	"	Max. Ni resist., Max oct., max. branch.	"	"	"	"	x
Advance 400	High liq. yield, red. coke gas. enhance macroporosity	GOs, resids, high metals feeds	Max. gaso., max. metals toler.	"	"	"	Zeo.	x
Advance 500	Max. oct. bbl, red. coke, gas. enhanced macroporisty	"	MAS. oct. bbl, high MON, high met. toler.	"	"	"	"	x
Advance 700	High liq. yields, high MON, red. coke, gas, enhanced macroporosity	"	Max. gaso., high MON Max. metals toler.	"	"	"	ADZ zeo.	x
Vision 40	Max. oct. bbl, red. coke, gas, high RON, MON, enhanced macroporosity	GOs, resids	Max. oct. bbl., high MON	"	"	"	"	x
CATALYSTS & CHEMICALS INDUSTRIES CO., LTD.								
MRZ-210	Low act., high liq. yield	FCC feed	Gaso. & LCO	MS	0.74*	SiO_2/Al_2O_3	Zeo.	x
MRZ-220	High liquid yield	"	"	"	"	"	"	x
MRZ-230	"	"	"	"	"	"	"	x
MRZ-203	High oct. metals tolerance	"	Gaso.	"	"	"	"	x
MRZ-204	"	"	"	"	"	"	"	x
MRZ-206	"	"	"	"	0.72*	"	"	x

(Continued)

Fluid catalytic cracking catalysts—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft,* g/cc	Carrier, support	Active agents	Availability
MRZ-203S	High oct. metal tolerance, high hydrothermal stab.	FCC feed, high metals feed	"	"	0.74*	"	"	x
MRZ-204S	"	"	"	"	"	"	"	x
MRZ-206S	"	"	"	"	0.70*	"	"	x
MRZ-208	High gaso. yield & oct.	FCC feed	"	"	0.68*	"	"	x
MZR-208S	"	"	"	"	"	"	"	x
MRZ-230	High gaso. yield, high metal feed tolerance	FCC feed, high metals feed	"	"	0.74*	"	"	x
MRZ-240	"	"	"	"	0.74*	"	"	x
MRZ-250	"	"	"	"	0.70*	"	"	x
Hylic-30	High liq. yield, high metals feed tolerance	FCC feed	"	"	0.80*	"	"	x
-40		"	"	"	"	"	"	x
Hycon-20	High oct., and metals tolerance, low coke	"	"	"	0.78*	"	"	x
-30		"	"	"	"	"	"	x
-40	"	"	"	"	"	"	"	x
Valec-50	High oct., high V tolerance	"	"	"	0.70*	"	"	X
Valec-60	"	"	"	"	0.68*	"	"	x
Valec-70	"	"	"	"	0.65*	"	"	x
BCZ-006S	High oct., low coke, high bot. cracking	FCC feed	"	"				
BCZ-007S	"	Resid feed	"	"				
BCZ-008S	"	"	"	"				
RCZ-540	High oct., low coke, high metal tolerarnce	FCC feed	"	"	0.75*	"	"	x
RCZ-550	"	"	"	"	"	"	"	x
RCZ-650	"	"	"	"	"	"	"	x
Octup	Oct. additive	"	"	"	0.70*	"	ZSM-5	x
CROSFIELD CATALYSTS								
XL Series	Bot. crack, & high gaso. and oct. selectivity	Gas oils	Bot. upgrade, high liq. product oct. and cet.	MS		SiO_2/Al_2O_3	Zeo. matrix	x
XL 60	"	"	Low act.	"	0.87*	"	"	x
XL 80	"	"	Medium act.	"	0.86*	"	"	x
XL 100	"	"	High act.	"	0.84*	"	"	x
SLS Extra series	High oct. gaso. liq. product	Gas oils, resids	Gaso., LCO,	"		"	"	
SLS 60 Extra			Low act.	"	0.75*	"	"	x
SLS 80 Extra			Med. act.	"	0.74*	"	"	x
SLS 100 Extra			High act.	"	0.72*	"	"	s
GLS Series	Coke select., gaso. mid. dist. oct., max. oct bbl	"	Max. gaso. oct. bbl, selective bot. crack.					
SLS-60	"	"	"	"	0.78* ABD	"	"	x
SLS-80	"	"	"	"	0.76*	"	"	x
SLS-100	"	"	"	"	0.76*	"	"	x
SLS extra series	High oct. gaso. liq. product	Gas oils, resids	Gaso., LCO	"	"	"		
FLS 60 extra	Low act.	"	"	"	0.75*	"	"	x
SLS 80 extra	Med. act.	"	"	"	0.74*	"	"	x
SLS 100 extra	High act.	"	"	"	0.72*	"	Zeo, CMT	x
QUANTUM Series	Max. octane low coke, gas select.	"	Oct., oct. bbls.	"		"	Zeo. CMT	x
Quantum 80	Oct. bbls., low coke/gas select.	"	Med. activity	"	0.74*	"	"	x
100	"	"	Low act.	"	0.72*	"	"	x
2000	Max. oct., oct. bbl, min.	"	Med. act.	"	0.74*	"	"	x
Quantum M Series	Max. oct., coke, gas select.	"	Oct., oct. bbl	"		"	"	x
Quantum 80 M	"	"	Med. act.	"	0.72*	"	"	x
Quantum 100 M	"	"	Low act.	"	0.70*	"	"	x
Vanadium trap (VT), FLuidization additive (CFA), and combustion promoter (CP) can be added to all catalysts								
DAVISON CHEMICAL DIVISION, W. R. GRACE & CO. (Each catalyst group arranged in decreasing order of activity)								
ASTRA-180	High act. w/ oct. bbl yield optimized, dual zeo. system	GOs, resid, CGO high N feed	Max. oct. bbl	MS	0.77*	SiO_2/Al_2O_3	Z-14G-US/REHY	x
ASTRA-170			"	"	"	"	"	x
ASTRA-180	"	"	"	"	"	"	"	x
ASTRA-280	"	"	"	"	"	"	"	x
ASTRA-278	"	"	"	"	"	"	"	x
ASTRA-276	"	"	"	"	"	"	"	x
ASTRA-378	"	"	"	"	"	"	"	x
ASTRA-376	"	"	"	"	"	"	"	x
ASTRA-374	"	"	"	"	"	"	"	x
DA-440	Max. unit ret. high act., bott. cracking	Gas oil, resid, high N feeds	Max. liq. yield	"	0.82*	"	REY	x
DXB-150	Bot. cracking w/ coke select.	"	Bot. upgrd. w/high oct. bbl yield	"	0.77*	"	Z-14-US/REHY	x
DXB-410	oct. bbl performance	"		"	"	"	"	x
GENCAT-1	High act. flushing, good coke and gas select.	GO, resid	Liq. yield, act. maint. in high metal	"	0.78*	"	"	x
GENCAT-0		"		"	"	"	"	x
GX-20	High act., bot. cracking w/N and metals tolerance	GO resid, coker/high N feeds	Max. liq. yield	"	0.74*	"	REY	x
GXO-29	High act./stab. w/high oct. bbl yield, coke & dry gas select., hydrothermal stab.	GO, resid, coker, high N feeds	High oct. bbl	"	0.77*	"	Z-14 US	x
GXO-28			"	"	"	"	"	x
GXO-25 +		"	"	"	"	"	"	x
GXO-25	"	"	"	"	"	"	"	x
GXO-41	High act. w/ low coke & gas, bott. upgrading	CO, resid, high N feeds	Max. liq. yields	"	0.78*	"	REHY	x
GXO-40			"	"	"	"	"	x
GXO-27	"	"	"	"	"	"	"	x

(Continued)

Fluid catalytic cracking catalysts—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft,* g/cc	Carrier, support	Active agents	Availability
Super Nova D	Max. oct. bbl min. coke, max. retent, bot. cracking	VGO/resids/CGOs high N feeds	Bot. retent, high oct. bbl	"	0.80*	"	Z-14 US	x
Nova D				"	"	"	"	x
Super Resoc	"	"	"	"	"	"	"	x
Resoc-1	"	"	"	"	"	"	"	x
Resoc-2	"	"	"	"	"	"	"	x
Resoc-1M	"	"	"	"	"	"	"	x
Resoc-G	"	"	"	"	"	"	"	x
Resoc-GM	"	"	"	"	"	"	"	x
Octacat +	Max. oct. w/ unsurpassed stab. & coke & dry gas select., metals tolerance	Go, resid, CGOs, high N feeds	Highest Gaso. octs.	"	0.72*	"	Z-14 US	x
Octacat			"	"	"	"	"	x
Super Octacat-B +		"	"	"	"	"	"	x
Super Octacat-B	"	"	"	"	"	"	"	x
Octacat RN +	"	"	"	"	"	"	"	x
Octacat RN	"	"	"	"	"	"	"	x
Octacat-D +	"	"	"	"	"	"	"	x
Octacat-D	"	"	"	"	"	"	"	x
Octacat-GD	"	"	"	"	"	"	"	x
Octacat-GDM	"	"	"	"	"	"	"	x
ENGELHARD CORP.								
ULTRASIV-280	US-280 highest act., van. toler. low gas, attrit. resist.	Gas oils, gas-oil resid mix resid	Incremental resid processing	MS	1.1*	In situ SiO_2/Al_2O_3	Zeo. mod. RE, Mod. SA	x
-260	"	"	"	"	"	"	"	x
-250	"	"	"	"	"	"	"	x
-240	"	"	"	"	"	"	"	x
-230	"	"	"	"	"	"	"	x
-220	"	"	"	"	"	"	"	x
HEZ-55	HEZ-55 highest act., EPZ designates CO promoted	Gas oils, high N-gas oils, Calif. gas oils	Bot. upgrade oct. bbl, cet.	MS	1.0*	"	Zeo., moder., RE high SA	x
EPZ-55	"	"	"	"	"	"	"	x
HEZ-54	"	"	"	"	"	"	"	x
-53	"	"	"	"	"	"	"	x
-52	"	"	"	"	"	"	"	x
-50	"	"	"	"	"	"	"	x
MAGNASIV-380	MAG-380 highest, act., low coke, gas make, metal toler., upgrade	Gas oils, high N gas oils, Calif. gas oils	Max. liq. yield	"	1.05*	"	Zeo., RE,	x
-370								x
-360								x
Octasiv Plus-680	680 highest act., stab. metals toler., hydrothermal stab., bot. upgrade	Gas oils, gas oil-resid, resid	Max. oct. bbl	MS	1.0*	"	Ultrastable zeo., low RE, low matrix SA	x
-670								
-660								
-580	580 highest act., stab., metals toler., hydrothermal stab.	"	Max. olefin production	"	1.0*	"	Ultrastable zeo. mod. matrix SA	x
-570		"		"	"	"		
-560	"	"	"	"	"	"		
-160	160 highest act., oct. adv. over REO	"	Bot. upgrade & metals toler.	"	1.0*	"	Ultrastable zeo., low RE, mod. matrix SA	x
-150		"		"	"	"		x
-140	"	"	"	"	"	"		x
ULTRASOX	Available in a variety of cracking & S reduction acts.	High gas oils, gas oil resid mix	SO_x reduction	"	1.1*	"	Zeo., prop. SO_x reduction	x
HFZ-33	HFZ-33 highest act.	Gas oils	Olefins feed, high oct. cet.	"	1.0*	"	Zeo., no RE, high SA	x
-20	"	"		"	"	"		x
-23	"	"	"	"	"	"	"	x
-25	"	"	"	"	"	"	"	x
ULTRADYNE-980	UD 980 highest act., low matrix SA	"	Low coke prod., low gaso., bromine No. high gaso. yield, low dry gas yield	"	1.0*	"	Zeo.	x
-970		"		"	"	"	"	x
-960	"	"		"	"	"	"	x
-950	"	"		"	"	"	"	x
-940	"	"	"	"	"	"	"	x
-930	"	"	"	"	"	"	"	x
ULTRADYNE PLUS-	UDP 1580 highest act., low	Gas oil, resid	Oct. bbl, low coke,	"	1.0*	"	Ultrastable	x
1580							zeo., low RE,	x
1560	matrix, oct. cat.	"	dry gas	"	"	"	low matrix SA	x
1550	"	"	"	"	"	"		x
1540	"	"	"	"	"	"	"	x
1530	"	"	"	"	"	"	"	x
Dynacat-1080,	DC 1080 highest act. V tolerant	Resid, high metals gas oil	High act. maint. contaminated situations	MS	"	"	"	x
-1070				"	"	"	"	x
-1060				"	"	"	"	x
-1050	"	"	"	"	"	"	"	x
-1040	"	"	"	"	"	"	"	x
-1030	"	"	"	"	"	"	"	x
Dynasiv-780	DS 780 is highest act.	Gas oil, mild resid	Mod. oct. bot. upgrade, high gaso. select.	"	"	"	"	x
-770				"	"	"	"	x
-760				"	"	"	"	x
-750	"	"	"	"	"	"	"	x
-740	"	"	"	"	"	"	"	x
-730	"	"	"	"	"	"	"	x
Dynasiv Plus-880	DSP 880 is highest act.	Gas oil/ resid	Oct. gaso. select., bot. upgrade	"	"	"	Ultrastable zeo.	x
-870								
-860				"	"	"	"	x
-850	"	"	"	"	"	"	"	x
-840	"	"	"	"	"	"	"	x
-830	"	"	"	"	"	"	"	x

(Continued)

Fluid catalytic cracking catalysts—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft,* g/cc	Carrier, support	Active agents	Availability
OCTIDYNE-1170,	OD 1170 is highest act., RON, MON imp., low coke	Gas oil/ resid	Max. oct. max. gaso. select., reduced regen. temp	"	"	"	"	x
-1160								
-1150				"	"	"	"	x
-1140	"	"		"	"	"	"	x
-1130	"	"	"	"	"	"	"	x
DYNASOX-1380,	DSX 1380 is highest act.	"	Mod. SOx red. gaso. select., bot. upgrade	"	"	"	Zeo.	x
-1370		"		"	"	"	"	x
-1360				"	"	"	"	x
-1350	"	"	"	"	"	"	"	x
-1340	"	"	"	"	"	"	"	x
-1330	"	"	"	"	"	"	"	x
Nitrodyne 1490	ND 1490 is highest act. oct. cat.	High N feed, coker gas oils	High in-unit act., conver., bot. upgrade	"	1.0*	SiO_2/Al_2O_3	Zeo.	x
1480				"	"	"	"	x
1470				"	"	"	"	x
Z-100		Gas oil feed	RON, MON, imp.,	"	"	"	ZSM-5	x
VHS series	"	"	Max. oct., coke Select., bott. upg., low gas	"	"	"	No. RE, DY zeo. act. stab. crystalline alum. matrix	x
F/X series	Opt. oct, opt. gaso. yields	"	High oct., high gaso coke sel., bot. upg., low gas	"	"	"	" except low RE	x
FORCE series	High oct. from high met. ops.	Hvy. GOs, high met. resids	High oct, high gaso, coke sel., bot. upg., met. toler., low gas	"	"	"	"	x
FOCUS series	High oct. gaso., low gas, coke	GOs, resids	High oct., high gaso., coke sel., bott. upg., low gas	"	"	"	"	x
FSS series	Max. gaso., very stable	GOs, hvy. GOs, resids high N feeds, severe ops.	Max. gaso., coke sel., bot. upg. low gas	"	"	"	" except high RE & low soda	x
HRO series	Max. oct. bbl	GOs, hvy GOs, resids	Good oct., high gaso., coke sel., bot. upg, low gas	"	"	"	" except mod. RE	x
SOC series	Very stab., high act., low coke	Hvy. GOs, high metals resids	Good oct., high gaso., coke sel. bot. upg, met. tol. low gas	"	"	"	"	x
ROC series	Resists metals, low coke	"	"	"	"	"	" except high RE, & not low soda	x
OCTEX series	High yields, high oct.	"	" except high oct.	"	"	"	"except mod. RE	x
FOC series	"	"	"	"	"	"	"	x
FLEX series	General purp.	GOs, resids	Max. gaso. sel., min. gas make, for units not req. max. stab. bot. upg., low gas	"	"	"	High RE DY zeo active stab. crystalline alum. matrix	x
EXSEL	General Purp.	"	high gaso. sel., bot. upg., metals toler., low gas	"	"	"	" except mod. RE	x
DOC series	Diesel oil production	"	Max. LCO yield, high cet., bot. upg., low gas	"	"	"	" except low RE	x
CAMPRO	Applied to all product lines, opt. matrix act.	GOs, hvy. GOs, resids	Opt. matrix act. of any Filtro FCC cat.	"	"	"	Active stab. crystalline alum. matrix	x
BCA	Bottoms cracking additive	High met. resids	Bot. upg., metals flush	"	"	"	"P"	x
ZSM-5	Oct. additive	Paraffinic feeds	High oct. gaso.	"	"	"	Sh. sel. zeo.	x
INTERCAT CORP.								
Z-CAT PLUS	Octane additive	FCC feeds	High oct. gaso.	"	50	"P"	ZSM-5	x
KATALISTIKS INTERNATIONAL								
Alpha 540	High activity oct.	Gas oils, resids, red. crudes	Max. oct. bbl, high select.	MS	0.74*	SiO_2/Al_2O_3	LZ-210 act. matrix	x
-640	"			"	0.73*	"		x
-545	"	"	"	"	0.74*	"	"	x
Beta-540	Max octane	"	Max. octane, coke select.	"	0.73*	"	"	x
-545	Enhanced bot. crack, metal resis	"		"	0.73*	"	"	x
-640	Max octane	"	"	"	0.72*	"	"	x
-600	Highest poss. octane	"	"	"	0.72*	"	"	x

(Continued)

Fluid catalytic cracking catalysts—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft,* g/cc	Carrier, support	Active agents	Availability
EPSILON-540	High oct. with high act.	GO, resid, red. crude	High oct. w/high gaso. select.	"	0.74*	"	"	x
-640	"	"		"	0.73*	"	"	x
-545	Enhanced bot. crack., met. resis	"	"	"	0.74*	"	"	x
Gamma-419	High RON, MON, oct. bbl, high stab., excel. select.	"	High liq. mid-bbl yields, low gas, coke, 650+yields	"	0.74*	"	High SiO_2 zeo. matrix	x
-419 Plus	"	"		"	"	"	"	x
-645	Enhanced bot. crack., high RON/MON, metal. resist., good coke select.	"	"	"	"	"	"	x
Sigma-200 Plus	High oct. bbl, good coke, gas select., 5 act. levels for dist. gas operations	"	High liq., max mid-bbl yield, low coke, gas make	"	0.76*ABD	"	LZ-210 in act. matrix	x
-300 Plus		"		"	0.75*	"		x
-400 Plus		"		"	0.74*	"	"	x
-500 Plus	Hi oct. bbl, w/good coke/gas sel	"	"	"	"	"	"	x
-600 Plus	"	"	"	"	0.73*	"	"	x
-605 Plus	Enhanced bot. cracking	"	"	"	0.73*	"	"	x
Sigma-200	Gen. purp., high stab., 4 activity levels	Gas oil, resid, reduced crude, high N, coker gas oil	High liq., max. mid bbl yield, low 650+ yield, low gas, attr. res., low bromine No., balanced butane yields, high isobutane ylds.	"	0.75*	"	Mixed prem. zeo. matrix	x
-300				"	0.74*	"		x
-400	"			"	0.74*	"	"	x
-600	"			"	0.73*	"	"	x
-605	Enhanced bot. cracking	"		"	0.74*	"	"	x
EKZ-2	Gen. purp., 3 act. levels	Gas, dirty feeds, coker gas oils	High liq. yields low coke, gas	"	0.79*	"	Fully ReO exch. zeo.	x
-3	"			"	0.78*	"		x
-4	"	"	"	"	0.76*	"	"	x
BMZ-200	Flex. for max. dist. or gaso.	Gas oil, resid, red. crude, high N coker gas oil	High liq., max. mid bbl, low 650+ yields, low gas, attr. res., low bromine No., high isobutane yield	"	0.76*	"	High SiO_2 fully RE zeo. matrix	x
-300	"			"	0.75*	"		x
-400	"			"	0.74*	"		x
-600	"	"		"	0.73*	"	"	x
-695	Enhanced bot. cracking	"		"	0.72*	"	"	x
Ekonocat-1	Gen. purp., 2 act. levels	GO, dirty feeds, coker gas oils	High liq. yield, 1low gas, coke, low	"	0.76*	"	Mixed zeo. low SA matrix	x
-2	"			"	0.72*	"		x

W.R. GRACE CATALYSTS PTY. LTD. (see complete listing of Davison Chemical Division, W.R. Grace & Co.)

Hydrocracking catalysts

AKZO CHEMICALS INC./NIPPON KETJEN (All catalysts available as off-site presulfided)								
Ketjenfine, LC-Fining	(See Lummus Crest HC listing)	Resid HC		Cyl.		"P"	Co Mo	L
Ketjenfine H-oil (HRI Texaco)		Atm.vac. btms., hvy. crudes, bitumen, etc.	Dist., LSFO	"	"	"P"	CoMo & NiMo	L
Ketjenfine HC-143	(See BP HC listing)	VGO HC		"	"	"P"	"P"	L
KC-2000		VGO	Gaso./jet.	"	48	"P"		x
KC-2100		"	Gasoline	"	41	"P"		x
KC-2200		"	Mid. dist.	"	54	"P"		x
KC-2600		"	"	"	45	"P"		x
ARCO LYONDELL LICENSING INC.								
ARCO H-H Cat		Raw lube stock	High quality lube	"	48			L
BP								
MD-2		VGO	Mid. Dist.	"		"P"	"P"	L
BASF AG								
M 8-81	Hydrocracking	HGO, VGO	steam crckr. feed	Cyl. ext.	0.70*	SiO_2	Nio/MoO_3	L
M 8-86	"	"	Mid. dist.	"	0.80*	"P"	"	L
CHEVRON RESEARCH CO.								
ICR-106	High HDN, high cracking act. 1st, 2nd stage, HC, stable	VGO, CGO, LCO, AGO 1st stg. HC prod	Diesel, jet, naphtha 2nd stage feed	"	55-63	"P"	"P"	L
ICR-120	Max. diesel, 2nd stg. HC, Stable	"	Diesel, jet, naphtha	"	50-58	"P"	"P"	L
ICR-126	High act., longer life than 106	VGO/CGO/LCO/AGO	" + 2nd stg. feed	"	55-63	"P"	"P"	L
ICR-113	Lower cost	" + DAO	"	"	45-53	"P"	"P"	L
ICR-117	Naphtha yield	VGO, CGO, LCO, AGO	"	"	50-58	"P"	"P"	L
ICR-204	High act., selec., long life	Hydrofined VGO,	Reform. feed, lt.	"	53-61	"P"	"P"	L
ICR-207	Long cycle life	CGO, LCO	naphtha, jet	"	32-40	"P"	"P"	L
GC-36	Max. gaso. HC	Dist. lt gas oils	Gaso., naphtha kero. jet	"	50-60	SiO_2/Al_2O_3	"P"	x
GC-30	Max. dist.HC	Dist., Hvy. VGO	Furnace oil, diesel, jet, kero.	"	50-60	"	"P"	L
CRITERION CATALYSTS CO. LP								
IPB-2		AGO, VGO	Gaso., dist.	Cyl.	Silicates	"P"	"P"	L
HC-102	(See Unocal listing)							
MD-2	(See BP HC listing)							
HDS-1442-B	Ebullating bed	Resid HDT		"	34	Al_2O_3, MoO_3	CoO/Nio/MoO_3	L
HDS-1443B	"	"		"	36	"	"	L
GC-30-36	(See Chevron Research listing)							
C 324	HDN, 1st stage HC	Coal oil HC		"	0.86*	Al_2O_3	NiMO	x
424	"	1st stage HC		"	0.82*	"	"	x
411	"	"		"	0.85*	"	"	x
Z 703	(See Zeolist Enterprises HC listing)							
753	"	"	"	"	0.70*	Crystalline	"	x

(Continued)

Hydrocracking catalysts—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft,* g/cc	Carrier, support	Active agents	Availability
C 354	Hvy. dist. HC	"		"	1.02*	Al_2O_3	"	x
454	"		"	"	1.05*	"	"	x
ICI KALTALCO/ICI CATALYSTS								
594	HDN, 1st stage HC	AGO, VGO	2nd stage feed	Katform	51	Al_2O_3	Nio/MoO_3	x
599	"	"	"	1/16-1/8	57	"	"	x
545	"	"	"	"	50	"	"	x
KAT 4000	Ebullated bed HC	Resid (H-oil), (LC-Fining)	FCC feed	1/32 cyl.	34	"	CoO/MoO_3	x
5000	"		"	"	"	"	"	x
LUMMUS CREST INC.								
LC-Fining	Hvy. feed, metals tolerance	Atm. bott., vac. bot. hvy crudes, tars, etc.	Dist., low S fuel	Cyl.	Low	"	CoMo/NiMo	L
PROCATALYSE								
HYC 642	High cracking act.	Gas oil, VGO	Kero., GO	Ext.		Special	NiMo	x
632	Cracking act.	"	GO	"		"	"	x
652	High cracking act.	"	Naphtha, Kero.	"		"	"	x
UOP								
DHC-2	Bifunctional, strong hydrogenation good crack. act.	VGO, DAO, CGO other non-SR gas oils	High select. to mid. dist.	Sph.	41	Amorphous	"P"	
-6	Bifunctional, good hydrogeneration, very good crack. act.	"	"	"	44	"	"P"	
-8	Bifunctional, excellent hydro. very good crack. act. imprv. temp. stability	"	"	"	44	"	"P"	
-100	Bifunct. excell. hydro., imp., crack. act., greater temp. stab.	"	"	Ext.	"P"	"P"	"P"	
HC-8	2nd stage high act., very act., stable	"	High naphtha select.	Cyl.	42	Zeo.	"P"	
HC-100	" + more act. than HC-8	"	"	"	48	Zeo.	"P"	
HC-101	High act., strong hydrog.	"	High LPG select.	"	50	Zeo.	"P"	
RCM-3	High act., ebullating bed resid conver. units, high strength	Vac. resid	Naphtha, distillates, gas oils	Sph.	41	"P"	"P"	
RCM-4	"	"	"	"	39	"P"	"P"	
HC-14, 16, 18, 22, 24, 28, 30, 80	(See Unocal Corp. hydrocracking listing)							
UNOCAL								
HC-14	Flexibility for fuels	Virgin cracked dist., VGO	Gaso., kero., jet, dist. VGO	Cyl.	"P"	Mol sieve	Non-noble metals	L
HC-16	"			"	"P"	"		L
HC-18	Max. gaso., LPG, naphtha	"	LPG, gaso., petchem. naphtha	"	"P"	"	Noble metals	L
HC-22	Max. diesel, jet	"	Diesel, jet	"	"P"	"	Non-noble metals	L
HC-28	Max. LPG, gaso., petchem. naphtha	"	LPG, gaso., petchem naphtha	"	"P"	"	Noble metal	L
HC-30	Select. HC for pour pt. red.	Petroleum & shale oil	Low pour pt. dist.	"	"P"	"	Non-noble metals	L
HC-80	"	fractions	lube stocks, syncrds	"	"P"			L
HC-102	Max. diesel	Virgin & cracked	Diesel	Sh. Ext.	"P"	Amorphous	metals	L
ZEOLIST ENTERPRISES								
Z-753	Naphtha select., 2nd stg., imp. act., select., & stab.	SR and cracked GOs, VGO, recyc. or 1 pass	High naphtha select.	Ext.	40	Mole sieve	Non-noble metals	Contact Criterion
-703	Dist. select., 2nd. stg., imp. act., select., & stab.		High dist. select.	"	"	"	"	"

Mild hydrocracking catalysts

AKZO CHEMICALS INC./NIPPON KETJEN (All catalysts available as off-site presulfided)								
KF-1011	Conversion & HDS	VGO	Mid. dist.	Cyl.	51	Al_2O_3	NiMo	x
KF-1012	"	"	"	"	42	"	CoMo	x
KF-1014	"	"	"	"	42	"	"	x
KF-1015	"	"	"	"	42	"	NiMo	x
KC-2600	"	"	"	"	45	"	"P"	x
TLF-141 (Elf)	"P"	Pour pt. protect.		Cycl.	"P"	"P"		L
BASF AG								
M 8-82	Mild HC	HGO, VGO	Mid. dist., FCC Feed	Cyl. ext.	0.70*	SiO_2	NiMo/MoO_3	L
BP								
MH-128	Mid. dist. selectivity	VGO	"	Sh. ext.	45	"P"	"P"	x
CATALYST & CHEMICALS INDUSTRIES CO. LTD.								
HT-D3	High mid. dist. yield	VGO	Kero., diesel & desulf.	Cyl.	0.76*	Al_2O_3		x
HT-D5	"	"		"	0.78*	"		x
HT-D7	High HDS, mid. dist. yield	"	"	"	0.78*	"		x
CRITERION CATALYSTS CO. LP								
HCM-40	(See Unocal MHC listing)							
-110	"							
MHC-1	Combined conv. & HDS act.	VGO	Mid. dist. + treated	Cyl.	0.86*	"	NiMo	x
MHC-200	Low pressure MHC	"	"	"	0.76*	"	CoMo	x

(Continued)

Mild hydrocracking catalysts—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft,* g/cc	Carrier, support	Active agents	Availability
CHEVRON RESEARCH CO.								
ICR 106	High cracking act., select for mid-dist.	VGO, CGO, LCO, AGO	Diesel, FCC feed, LSFO	Cyl.	55-63	"P"	"P"	L
ICR-126	Longer life, higher conv.	"	Diesel, naphtha, FCC feed, LSFO	"	55-63	"P"	"P"	L
ICR-114	Lower cost	"	Diesel, FCC feed, LSFO	Cyl., sh.	42-54	"P"	"P"	L
ENGELHARD CORP.								
HPC-50	High act. N removal, polynuclear aro. sat., high S removal, severe operations	HVGO, VGO, LCO, CGO coker dist., lube stocks	FCC, HC feed pretreat, lubes	Kloverleaf cyl., ext. 4-lobed	51	"	NiMo/MoO_3	x
EXXON RESEARCH & ENGINEERING CO.								
RT-2	Tailored for resids	Resid	Naphtha, diesel			Tailored pore size	CoMo	L
-228	"	"	"				NiMo	L
-621	"	"	"			"	CoMo	L
RT-3	Tailored for gas oils	Virgin cracked GOs	"			"	CoMo	L
TN-8	"	"	"			"	NiMo/CoMo	L
HALDOR TOPSOE								
TK-551	High stability	VGO range	Mid. dist., treated VGO	Cyl.	42	Al_2O_3	NiMo	x
TK-581	"	"		"	42	"	"	x
ICI KATALCO/ICI CATALYSTS								
497	Combined conver. & HDS act.	Gas oils	Mid. dist.	Katform	44	"	CoO/MoO_3	x
499	Combined conver. & deep HDS act.	"	"	1/16, 1/8	50	"	"	x
594	Combined conver. & high HDS, HDN act.	"	"	"	51	"	NiO/MoO_3	x
599	Combined conv. & deep HDS, HDN act.	"	"	"	57	"	"	x
545	"	"	"	"	50	"	"	x
PROCATALYSE								
HTH 544	Good stab., high mid. dist. selectivity	HVGO		Cyl.		SiO_2/Al_2O_3	NiMo	x
546		"		"		" + promoter	"	x
548	"	"		"	"	"	"	x
UNOCAL CORP.								
HCM-40	High stab. MHC	Virgin & cracked dist., VGO	Dist. + hot feed hydrotreated	Sh. ext.	"P"	"P"	"P"	L
HCM-110				"	"P"	"P"	"P"	L
UNITED CATALYSTS INC.								
C20-7-02	Composition, physical properties	Lube oil, HVGO	Hydrog. olefins, cracked product	Ext.	44	Al_2O_3	NiMo	x
C20-7-02CDS				"	"	"	"	x
C20-7-04	"	"	"	"	50	"	"	x
C20-7-06CDS	"	"	"	"	44	"	"	x
UOP								
DHC-2	Bifunctional clean-up, hdrog., good cracking act.	VGO, CGO	Dist. HDS, lubes	Sph.	41	"P"	"P"	x
MHC-10		"	"	Cyl.	42	"P"	"P"	x

Hydrotreating/hydrogenation, saturation catalysts

AIR PRODUCTS & CHEMICALS INC.								
HR 836	Pretreat	Py gaso.	Sat. hydrocarbons	Cyl.		Al_2O_3	CoMo	L
AKZO CHEMICALS INC./NIPPON KETJEN (All catalysts available as off-site presulfied, Q = quadralobe)								
A-540	Act. suppt., rpl. inert material	All types		Q	36	Al_2O_3	NiMo	x
A-541	"	"		"	36	"	CoMo	x
KAS-5B	"	"		Sph.	52	"	NiMo	x
AS-20	"	"		Q		"	"	x
KG-1	Descaling/guard	"		Sph.		"	"	x
KF-H-oil	Ebullating bed	Resid., hvy. crude, bitumen	Dist., LSFO	Cyl.	"P"	"	CoMo	L
"	"		"	"	"	"	NiMo	L
KFR-10	Fixed bed	Resid HDM	"	Q		"	"	x
-30	"	Resid HDM/HDS	"	"		"	"	x
-50	"	Resid HDS	"	"		"	"	x
-70	"	"	"	"		"	"	x
KF INT-RI	"	Resid HDM	"	"		"	"	x
KF8-840	High HDN, HDS, sat.	Naph. to VGO, FCC/HC-PT, lube		Q	51	"	NiMo	x
-842	High HDN/HDS	SR/Cr. naph./CO		"	47	"	"	x
-843	Highest HDN/HDS/aro. sat.	FCC/HC-PT, lube		"	56	"	"	x
-844	High HDS/HDN	Cracked naph.		"	47	"	"	x
-845	"	Naph. to VGO,		"	44	"	"	x
-8010	"	FCC-PT, lube		Cyl.	54	"	"	x
-330	H.P. aro. sat.	Naph. to VGO		"	52	"	NiW	x
KF-124 LD	Gen. purp. HDT	SR naph. to dist.		Cyl.	38	"	CoMo	x
KF 124 HD	"	"		"	48	"	"	x
KF 165	"	Naph. to HVGO		"	48	"	"	x
KF 640	High HDS act.	Naph. to LGO		Q	43	"	"	x
KF-702	"	Naph. to VGO		Cyl.	49	"	"	x
KF-707	"	"		"	48	"	"	x
KF-742	Deep HDS	Naph. to VGO,		Q	45	"	"	x
KF-746	"	FCC-PT, lube		"	37	"	"	x
KF-752	Highest HDS act.	"		"	47	"	"	x
KF-VGO-Demet	HDM of HVGO/DMO/DAO	HVGO/DMO/DAO		"	36	"	"	x
KF-901	High HDS/HDM/MHC	Naph. to VGO		Cyl.	47	"	NiMo/CoMo	x
KF-643	HDM/HDS of resid	Resid		Q	39	"	"	x

(Continued)

Hydrotreating/hydrogenation, saturation catalysts—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft,* g/cc	Carrier, support	Active agents	Availability
BASF AG								
M 8-10		Coker benzene	Benzene	Tablets	0.70*	"	CoO/MoO3	x
M 8-12		Naphtha, kero., mid. dist., HGO/VGO	Distillates	Cyl. ext.	0.70*	"	"	x
M 8-14		"	"	Star + cyl ext.	0.75*	"	"	x
M 8-21		Blend of HGO/VGO w/cracked oils	Mid. dist., FCC feed, lubes	"	0.70*	"	NiO/MoO3	x
M 8-25	Aro. hydrogenation	Kerosine	Imprv. smoke pt.	Cyl. ext.	0.82*	"	"	x
M 8-26	High MON/HDS act., olefin hydrogenation	Naphtha, Kero., mid., dist., VGO, HGO	HC pretreat	Star + cyl. ext.	0.85*	Special	"	x
M 8-30		Coker benzene	Benzene	Cyl. ext.	0.72*	Al_2O_3	MoO3	x
H 0-11		Select. hydro. of acetylene in ethylene	Ethylene	"	0.46*	SiO_2	Pd	x
H 0-12		Select. hydro. of acetylene in C3-and C4-		"	1.1*	Al_2O_3	"	x
H 0-22		Select. Hydro. of diolefins * unsat. aros.	Py. gaso. + sph.	Cyl. ext.	0.65-0.80*	"	"	x
H 1-80		Hydro. of aromatics	Food-grade white oil	Cyl.	1.0*	SiO_2	Ni	x
CRITERION CATALYSTS CO. LP								
HDS-2(1.6)	Different particle sizes	Naphthas thru LGO		Cyl.	36	Al_2O_3	CoO/MoO_3	x
HDS-2(3.2)	"		"	"	"	"	x	
TRILOBE HDS-3(1.6)	"	"	sh. ext.	"	"	"	x	
TRILOBE HDS-3(3.2)	"	"	"	"	"	"	x	
HDS-9(1.6)	"	"	"	49-52	"	"	x	
HDS-9(3.2)	"	"	"	"	"	"	"	x
TRILOBE HDS-9(1.6)	"	"		"		"	"	x
TRILOBE HDS-9(3.2)	"	"		"		"	"	x
AS-10	(See Unocal listing)							
TRILOBE	Different part. sizes	Naphthas thru HGO		Sh. ext.	54	Al_2O_3	CoO/MoO	x
HDN-60(1.6)	"	"	"	"	"	"	"	x
HDN-60(3.2)	"	"	"	"	"	"	"	x
RT-3	(See Exxon R & E listing)							
IMP-DSD-3	(See Instituto Mexicano del Petroleo listing)							
TRILOBE HDS-24(1.6)	Different part. sizes	Naphthas thru HGO		Sh. ext.	35	Al_2O_3	CoO/MoO_3	x
-24(3.2)	"	"		"	"	"	"	x
TRILOBE HDN-34(1.6)	"	"		"	"	"	NiO/MoO_3	x
-34(3.2)	"	"		"	"	"	"	x
RIFLED TRILOBE HDS-22(1.6)	"	"		"	43	"	CoO/MoO_3	x
HDS-22(3.2)	"	"		"	"	"	"	x
C 214L	Multi-purpose HDT	Naphtha to HVGOs		Sh. ext.	0.61	Al_2O_3	NiMo	x
324	High perf., HDS, HDN	Coker naphtha & py.		Cyl.	0.86*	"	"	x
424	High act. HDS/HDN, sat.	Pretreat cracker feed		"	0.82*	"	"	x
C 514	Support function, replaces inert ceramic material	All HDT applications, preferentially cracked feeds		Sph.	0.80*	"	"	x
C 344	Heavy duty HDS	Wide variety of stocks, HVGO		Cyl.	0.78*	"	CoMo	x
344T	"			Sh. ext.	0.73*	"	"	x
434	High eff. desulf.	Naphtha/GO		Ext.	0.65*	"	"	x
444	High activity HDS	VGO/LGO/HGO		Cyl.	0.77*	"	"	x
444T	"	cracked GO		Sh. ext.	0.72*	"	"	x
447	Deep HDS	VGO/Resid/LGO, HGO		"	0.71*	"	"	x
C 544	Support function, can replace all ceramic material			Sph.	0.80*	"	"	x
C127	Initial residue HDS	Hvy. resid w/moderate metals content		Cyl.	0.70*	"	NiMo	x
227	Tail end deep residue HDS			"	"	"	"	x
147	Initial residue HDS			"	"	"	CoMo	x
247	Tail end residue HDS	"		"	"	"	"	x
311	Hydrocracker tail end	Hydrocracked feed		Sh. ext.	0.76*	"	NiMo	x
C-614	Hydrog. of aromatics	Kero., speciality oils		Ext.	0.41*	SiO_2/Al_2O_3	Pt	x
Z 704A	(See Zeolist Enterprises Hydrotreating/hydrogenation listing)							
C 204	Hydrog. of olefins	"		"	"	Al_2O_3	"	x
C 874A	Acetylene to ethylene			Cyl.	0.77*	"	Noble metal	x
ENGLEHARD CORP.								
HPC-8	Low density, high pore vol.	Naphtha thru VGO	HDS	Kloverleaf or cyl.	33	"	CoO/MoO_3	x
-6B	Low density	"	"		39	"	"	x
-40B	HDS, HDN	CGO, HVGO, LCO,	FCC feed gaso., jet	"	47	"	NiO/MoO_3	x
-312	Actilife base, high act.	Sev. HDS/HDM resid., FCC feed pretrt.	"		Custom	"	NiMo + "P"	x
-416	" + max. stab.			"		"	"	x
-50	HDS, HDN, PNA sat.	Dist. naphtha, lube	" + lube	"	51	"	"	x
-70	High act. HDS/HDN/PNA sat., severe operations	"	FCC feed, HC pretreat, lube	"	51	"	"	x
-66	HDS	HS HGO, htg. oil, Hvy. VGO	GO, htg. oil, gaso.	"	44	"	CoO/MoO_3	x
NI 4352	High yields			"	59	SiO_2/Al_2O_3	NiW	x
4342	"	HC/lube oil		"	"	"	"	x
-60	High act. HDS	finish., aro. sat. naphtha	"	"	46	"	"	x

(Continued)

Hydrotreating/hydrogenation, saturation catalysts—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft,* g/cc	Carrier, support	Active agents	Availability
EXXON RESEARCH & ENGINEERING CO.								
RT-3	High act., regenerability	Virgin cracked naphthas, dist.	Feed prep. for ref., jet./diesel			Tailored pore size	CoMo	L
TN-8	"						NiMo/CoMo	L
HALDOR TOPSOE								
TK-250	HDS	Gas & Naphtha	Deep HDS, stm. ref.	Ring	31	Al_2O_3	CoMo	x
-251	"	"	"	"	"	"	NiMo	x
-450	"	Naphtha	Deep HDS	Cyl.	32	"	CoMo	x
-451	"	"	"	"	"	"	NiMo	x
-550	HDN	SR. & Cr. kero. -HVGO"	Deep HDS/HDN	Rng/cyl.	37-42	"	"	x
-561	Extra HDN		"	"	40-45	"	"	x
INSTITUTO MEXICANO DEL PETROLEO								
IMP-DSD-3	High act. TRILOBE	Petro. fract.	Naphtha, high diesel act., FCC feed	Sh. ext.	0.74*	Al_2O_3	Mo/Ni/P	L
-DSD-4	High act. sphere	"		Sph.	0.55*	"	Mo/Ni	L
-DSD-5	Good act. sphere	Gaso. to diesel HDS	Naphtha, good qual. diesel	"	0.55*	"	Mo/Ni/P	L
-DSD-1	"	"		"	0.86*	"	Mo/Ni	L
ICI KATALCO/ICI CATALYSTS								
477S	High pore vol., high resist. 1to SiO_2, Pb, aresn. poisoning, HDS	Naphtha blends	Reforming	Sph.	33	"	CoO/MoO_3	x
482	Low density HDS	" + BTX cuts	"	Cyl.	32	"	"	x
477	High HDS	Naphtha thru GOs	Ref./diesel treating FCC feed	Cyl.	44	"	"	x
479	Deep HDS sat., HDN	Dist. thru hvy. GOs	Diesel trtg./FCC fd.	Cyl.	50	"	"	x
497	High HDS	Naphtha thru GOs	"	Katform	44	"	"	x
499	Deep HDS, sat.	Naphtha thru hvy. GOs	"	"	50	"	"	x
502S	High pore vol., high resist to SiO_2, Pb, arsenic poisoning, HDS, HDN	Naphtha blends	Reforming	Sph.	33		NiO/MoO_3	x
502	HDS, HDN	" + coker dist. blends	Ref., jet., fuel oil	Cyl.	44	"	"	x
504K	High HDS/HDN/sat.	Naphtha thru GO blends, LCO	" + FCC feed	Cyl.	51	"	"	x
506	Deep HDS, HDN, sat.	100% coker naphtha, hvy. GOs/CGO/LCO resid blnds. lubes	Ref., FCC feed HC feed	" "	58 57	" "	" "	x x
592	HDS HDN	Naphtha blends, coker dist. blends	Ref., jet., fuel oil	Katform	44	"	"	x
594	High HDS, HDN, sat.	Naphtha blnds thru GO blends, LCO	" + FCC feed	"	51	"	"	x
535	High HDS, HDN, sat., low dens.	Naph. blnds. thru GO blnds., LCO	"	"	42	"	"	x
545	Deep HDS, HDN, sat.	Coker naph., naph. blnds thru hvy GOs/LCO	Ref., fuel oil, FCC feed, HC feed	"	50	"	"	x
599	"	Coker feeds, hvy. GOs GO & resid blnds, lube	Ref., FCC feed, HC feed	"	57	"	"	x
550	Olefin & aro. sat.	Cracked stocks/ coker stocks, LCO/lube		Cyl.	49	"	"	x
550S	" + low density			Sph.	34	"	"	x
620	Demet. catalyst	HGO/VGO resid blnds DTH bed	Demet. feed to main	Cyl.	35	"P"	"P"	x
PROCATALYSE								
LD 271	Select. hydrog. of propylene rich cut from steam cracking, also butene-1 rich cut	Steam cracker propylene rich, butene-1 rich cut	Propylene, butene-1	Sph.		"	Pd prom.	x
LD-273	MAPD removal from FCC C_3 cuts	FCC C_3 cut	C_3 cut	"		"	"	x
277	Acetylene removal from butadiene rich steam cracker cut	C_4 steam cracker cut	Butadiene rich C_4	"		"	"	x
2773	"	"	"	"		"	"	x
NiPS2	Total hydrog. of benzene into cyclohexane	Benzene	Cyclohexane	Powder		Ni	Ni	x
LD 145	Select. hydrog. of py. gas & 180-400 C. fraction	Py. gas.	Gaso.	"		"	NiMO	
155		" + hvy. gaso.	Gaso., special fuel	"		"	NiW	
241	Select. hydrog. of py. gaso.	Py. gaso.	Sweet gaso.	"		"	Ni	
265	Select. hydrog. of py. propylene cut, butylene cut, & gaso.	Py. propylene cut, butylene cut gaso.	Propylene, butylene, gaso.	"		"	Pd	
MEP 121	COS removal	C_3 cut	C_3 cut	Granules		Special		x
191	Arsenic removal	"	"	Sph.		Al_2O_3		x
841	"	Naphtha	Naphtha to select. hydrogenation	"		"		x
UNOCAL CORP.								
HC-H, HC-K								
AS-100	Sat. of aromatics	Naphtha, kero., jet.	Low aro. naphthas, high smoke pt. kero. jet	Cyl.	"P"	"P"	Noble metal	L
UNITED CATALYSTS INC.								
C20-5-01		SR, coker naphtha, kero. diesel	HDS, removal of metal contaminants imp. color, odor, stab.	Tablet or ext.	50	Al_2O_3	CoMo	x
C20-6-01	Composition, physical properties	Lt. naphthas thru hvy. resids.	HDS hydrog. of olefins	Ext.	38	"	"	x
-6-03				1/8,	44	"	"	x
-6-04	"		"	1/16	51	"	"	x
-7-02	"	Cracked stocks, high olefin, N content feed	HDS/HDN, hydrog. of olefins, de-wax	"	44	"	NiMo	x
-7-03	"			"	38	"	"	x
-7-04	"		"	Ext.	50	"	"	x
C20-6-04 CDS	High HDS act.	VGO/LGO/HGO		"	37-43	"	CoMo	x

(Continued)

Hydrotreating/hydrogenation, saturation catalysts—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft,* g/cc	Carrier, support	Active agents	Availability
C20-7-07 CDS	High HDS/HDN act.	Pretreat. FCC feed	FCC feed	Ext.	47-53	"	NiMo	x
G-87	Total hydrog. of benzene to cyclohexane	Benzene	Cyclohexane	Sph.	52-58		Ni	x
-98B		Benzene w/S	"	Tablet	48-52	SiO_2	Ni/Cu/Co	x
C46-7-03	High hdrog. activity	Aro. sat.		Ext.	40-48	"	Ni	x
-8-03	"	"		Ext.	"	Al_2O_3	Ni	x
G-68A	Hydrog. of C_5 dienes	Isoprene		Tablet	32-48	"	Pd	x
G-68C	Select. hydrog. DPG-diolefins	Py. gaso.	Gaso.	Sph.	42-48	"	"	x
G-68D	Select. hydrog. trace butadiene & isom. B_1 to B_2	C_3 - C_4 stream	Alky. feed	Tablet	64-69	"	"	x
C38-1	Select. hydrog. trace butadiene with isomerization	C_3 - C_5 stream with S	"	Ext.	52-58	Al_2O_3	Ni	x
C20-7-06 CDS			"	"	44	"	NiMo	x
UOP								
S-12	High HDS, HDN	Naphtha cracked stocks, high severity	HDS, HDN	Cyl.	49	"	CoMo	x
PF-4	Select. hydrog.	Alpha-meta-styrene in Cumene, diolefin sat.-	Cumene, py. gaso.	Sph.	32	"	Pd	
H-3	High hydrog. act., S tolerant	Aro. sat (usually benzene)	High-purity cycloparaffins (usually cyclohexane)	"	32	"	Pt	
H-4	High hydrog. act.	" + select. diolefin sat., methane	"plus upgrade alky feed"	"	44	"	Ni	
H-8	"	Aro sat. dist., sat. of resid. aros. in n- paraffin streams	Imp. burning or ign. qualities, high purity n-paraffins	Sph.	32	"	"	
ZEOLIST ENTERPRISES								
Z-704A	Hydrog. of PCA & Mono-aros. in S and N containing feeds	Fuels, solvents, lubes	Low aro. prods.	Ext.	"P"	Mole sieve	Noble metal	Contact Criterion

Hydrorefining catalysts

AKZO CHEMICALS INC./NIPPON KETJEN (All catalysts available as off-site presulfided)								
HC-K	(See Unocal hydrorefining listing)			Q	"P"	"P"	NiMo	L
Rf-100, 200, 220	(See Unocal hydrorefining listing)							L
RT-2, 3, 4, 228, 621, NX-1, TN-8	(See Exxon Research & Engineering Hydrorefining liting)							L
BASF AG								
M 8-24	Lube hydrofinishing	Raw lube feed	Lube, white oil	Cyl. ext.	0.72*	Al_2O_3	NiO/MoO_3	x
M 8-25	Wax HDT, paraffins	Slack wax	Food gr. paraffin	"	0.82*	"	"	x
H 1-80	White oil	Aro. hydrog.	Med grd. wht. oil	"	1.0*	"P"	NiO	L
CATALYST & CHEMICALS INDUSTRIES CO., LTD.								
CDS-R2	High HDS, low reaction temp.	Atm. & vac. resid	Desulf. oil	Cyl.	0.68*	Al_2O_3		x
-R9	High HDS & demet.	"	"	"	0.66*	"		x
-R25-HT	"	"	"	"	0.63*	"		x
-DM-1	High demet.	"	Demetallized oil	"	0.58*	"		x
-DM-5	High demet., with HDS	"	"	"	0.62*	"		x
CDS-D5	High HDS activity	Naphtha & kero.	Deslf. napht., kero.	"	0.68*			x
-D9	"	" + gas oil	Deslf. kero., VGO	"	0.72*	Al_2O_3		x
-D11	"	Kero., diesel VGO	Deslf. kero., diesel, VGO	"	0.73*			x
-D13	Superior high HDS act.	"		"	0.78*			x
-D15	"	"	"	"	0.73*			x
CDS-DN1	High HDS/HDN activity	Naphtha	Desulf. naphtha	"	0.77*	Al_2O_3		x
CHEVRON RESEARCH CO.								
ICR 112	High HDS act., low H_2 consumpt.	VGO, CGO	LSFO, FCC feed	"	42-54	"P"	"P"	L
114	High HDN activity	"	FCC feed	"P"	"	"P"	"P"	L
105	For resid HDS	DAO, topped crudes, atm., vac. resids	LSFO, FCC feed, coker feed	Cyl. or Sh	40-48	"P"	"P"	L
131	Low cost resid HDS			Sh. ext.	30-38	"	"	L
121	Resid feeds		"	"	34-42	"P"	"P"	L
122	Resid HDM	"	" + resid HDS feed	Sph.	28-38	"P"	"P"	L
132	" + high act.	"	"	Sh. ext.	30-38	"P"	"P"	L
GC-101	High metals resistant	HDS, atm., vac. resid	0.5-1.0% SHFO	Cyl.	30-40	Al_2O_3	"P"	L
-106	"		"	"	"	"	"P"	L
-102	High coke deact. resistant	HDS amt., vac. resids"	0.2-0.6% S HFO, resid, FCC feed prep	Cyl. sh. ext.	33-41	"	"P"	L
-107	HDS cat.				"	"	"P"	L
-100	High sev. resid HDS	"	0.05-0.2% S HFO	"	33-42	"	"P"	L
-105	"	"	"	"	"	"	"P"	L
-125	Metals resistant	High metals atm./ vac. resids	Demet./HDS	"	30-37	"	"P"	L
-130	"		"	"	"	"	"P"	L
GC-405	High act., hydrog., select HC	Conventional refined	Lube, base oils	"	40-48	"	"P"	L
GC-36	High act. hydro., select. HC	Poor quality lube feed	"	Cyl.	50-55	SiO_2, Al_2O_3	"P"	L
-30	Higher activity		"	"	50-60	"	"P"	L
-26	Selective hydrogenation	Semi-refined lube, speciality oil product feed	Lube indust. oils, speciality products	"	60-70	Al_2O_3	"P"	L
CRITERION CATALYSTS CO. LP								
HC-B, HC-D	(see Unocal Hydrorefining listing)							
TRILOBE HC-C, HC-H								
TRILOBE RF-11, RF-25								

(Continued)

Hydrorefining catalysts—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft,* g/cc	Carrier, support	Active agents	Availability
Rt-2, RT-3	(See Exxon Research & Engineering hydrorefining listing)							
CSM-471		Resid HD		Sh. ext.	"P"	"P"	"P"	L
HDS-1442-A	Different particle sizes	Resid or VGO HDT		Cyl.	34	Al_2O_3	CoO/MoO_3	x
-1442-B	"	"		"	"	"	"	x
-1443-A	"	"		"	"	"	NiO/MoO_3	x
-1443-B	"	"		"	"	"	"	x
HDS-9(1.6)	Diff. part. sizes & shapes	HGO/cat. feed HDT	Fuel oil/FCC feed	Cyl. or	49-52	"	"	x
9(3.2)	"	"	"	sh. ext.	"	"	"	x
GC-100,101, 102, 105, 106, 107	(See Chevron Research Co. hydrorefining listing)							
GC 405, 36, 30, 26	"							
TRILOBE HDN-60(1.6)	Different particle sizes	HGO/cat. feed HDT	Fuel oil/FCC feed	Sh. ext.	54	Al_2O_3	NiO/MoO_3	x
-60(3.2)	"	"	"	"	"	"	"	x
N-21, -22, -23, -30	(See Unocal hydrorefining listing)							
RIFLED TRILOBE HDS-22(1.6)	Different particle sizes	HGO/cat. HDT		Sh. ext	50	Al_2O_3	NiO/MoO_3	x
22-(3.2)	"	"		"	"	"	"	x
CSM-481		HGO thru resid		Sh. ext	"P"	"P"	"P"	L
482		"		"	"	"	"	L
CDM-152		"		"	"	"	"	L
TRILOBE HDS-22(1.6)	Different particle sizes	Fuel oil, FCC feed		"	43	Al_2O_3	CoO/MoO_3	x
-22(3.2)	"	"		"	"	"	"	x
C 214i	Multipurp. HDT	Naphtha to HVGO		"	0.6*	"	NiMo/P	x
324	High perf. HDS, HDN	Coker naphtha, py. gaso. to HVGO		"	0.86*	"	"	x x
424	High act. HDS, HDN, Sat.	Pretrt. of cracker feed, 1st stg. HC		"	0.82*	"	"	x
514	Suppt. function, repl. ceramic matl.	All HDT applications pref. crcked fd. stks.		Sph.	0.80*	"	NiMo	x
344	Hvy. duty HDS	Wide var. of feed including HVGO		"	0.75*	"	CoMo/P	x
344T	"	"		Sh. ext.	0.70*	"	CoMo/P	x
434	High eff. HDS	Naphtha, GO		Ext.	0.65*	"	CoMo	x
444	High act. HDS	VGO/LGO/HGO cracked GOs		"	0.77*	"	"	x
444T	"			"	0.72*	"	"	x
544	Suppt. function, replaces ceramic material	All HDT apps.		Sph.	0.80*	"	"	x
127	Intial resid HDS	Hvy. resid.		Ext.	0.70*	"	NiMo	x
277	Tail end deep resid HDS	Mod. metals		"	"	"	"	x
311	HC tail end catalyst	HC feed & naphthas		"	0.76*	"	"	x
614	Hydrog. of aros.	Kero * Spec. oils		"	0.41*	$SiO2/Al_2O_3$	Pt	x
Z 704A	"	"						
EXXON RESEARCH & ENGINEERING CO.								
RT-2	Contaminant toler. for resid proc., high act., regen.	Atm./vac. resids virgin/cracked GOS	Diesel, LSFO			Tailored pore size	CoMo.,	L
-228			FCC feed prep.				NiMo	L
-621	"		coking			"	CoMo	L
-3,	"	"	FCC feed prep.			"	"	L
TN-8	"	"	LSFO			"	NiMo/CoMo	L
HALDOR TOPSOE								
TK-550	High HDS act.	Virgin cr. kero. to	HDS	Rgn/cyl.	35-40	Al_2O_3	CoMo	x
-551	High HDN act.	HVGO	"	"	37-42	"	NiMo	x
-561	Highest HDN act.	"	HDS/HDN/PNA	"	40-45	"	"	x
-709	Low HDS/high HDM/high met. tol.	Amt./vac. resid	HDM	Ring	25	"	Mo	x
-710	Med. HDS/high HDM/high met. tol.	"	"	Rng/Cyl.	31-38	"	CoMo	x
-711	"	"	"	"	"	"	NiMo	x
-750	Good HDS/mod. HDM & met. tol	"	HDS/HDM	"	"	"	CoMo	x
-751	"	"	HDM	"	"	"	NiMo	x
-770	High HDS/low HDM & met tol.	"	HDS	Cyl.	40	"	CoMo	x
-771	"		"	"	42	"	NiMo	x
-753	Reduced sludge formation	Resid	Hydrocracking	"	37	"	NiMo	x
INSTITUTO MEXICANO DEL PETROLEO								
IMP-HDW-10	Zeolitic for dewax. lube oil cuts	Wide lube range	Dewaxed lube	Cyl.	0.80*	Zeo. Al_2O_3	Pt/zeo.	L
ICI KATALCO/ICI CATALYSTS								
477	High HDS	Gas oils	Fuel oils, FCC fd.	Cyl.	44	Al_2O_3	CoO/MoO_3	x
479	Deep HDS, HDN, sat.	Hvy. GOs	"	"	50	"	"	x
497	High HDS	Gas oils	"	Katform	44	"	"	x
499	Deep HDS, HDN, sat.	Hvy. GOs	"	"	50	"	"	x
504K	High HDS, HDN, sat.	GO blends	"	Cyl.	51	"	NiO/MoO_3	x
506	Deep HDS, HDN, sat.	GO & resid blnds.	"	"	57	"	"	x
594	High HDS, HDN, sat.	GO blends	"	Katform	51	"	"	x
535	High HDS, HDN, sat. low density	"	"	"	42	"	"	x
545	Deep HDS, HDN, sat.	Hvy. GOs, GO & resid blends	"	"	50	"	"	x
599	Deep HDS, HDN, sat.	"	"	"	57	"	"	x
KAT 4000	Ebullated bed HDS	Resid		Cyl.	34	"	CoO/MoO_3	x
5000	"	"		"	34	"	NiO/MoO_3	x
RT-2 -3	(See Exxon Research & Engineering hydrorefining listing)							
GC-101	(See Chevron Research Co. hydrorefining listing)							
-102, 106, 107	"							
PROCATALYSE								
HR 306	HDS, HDN	Naphtha thru VGO		Cyl.		Al_2O_3	CoMo	x

(Continued)

Hydrorefining catalysts—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft,* g/cc	Carrier, support	Active agents	Availability
308	HDT	Residues	"	"	0.67*	"	"	x
346	HDS/HDN/aro. hydrogenation	"	"	"	"	"	NiMo	x
348	"	Naphtha thru VGO	Desulf. N-free product	"	0.77*	"	"	x
354	"	"	N-free product	"		"	NiW	x
HMC 841	HDT, HDM	GO/VGO/atm., vac resid"		Sph.		"	NiMo	x
849	HDM			"		"	"	x
845	HDT, HDM	"		"		"	"	x
Actisphere 923	Catalyst protection & support	Naphtha thru resid		"		"	NiMo/CoMo	x
UNOCAL CORP.								
N-30	High act., HDS	Virgin, cracked, dist. naphthas, VGOs	Desulfurized products	Sh. ext. Cyl.	"P"	"P"	CoMo	L
-100	"				"P"	"P"	"	L
-23	"	"	"	"	"P"	"P"	"	L
-22	HDS, HDN	"	Low S, N prods.	"	"P"	"P"	NiMo	L
-21	"	"	"	"	"P"	"P"	"	L
HC-H	HDS, HDN	"	HC, FCC Feed	Sh. ext.	"P"	"P"	"	L
HC-K	"	"	"	"	"P"	"P"	"	L
HC-F	"	"	Dist. prods. HC/FCC feed	"	"P"	"P"	"	L
HC-D	"	"		"	"P"	"P"	"	L
HC-B	"	"	"	"	"P"	"P"	"	L
RF-11	HDS	Atm. resid., whole crudes	Fuel oil, FCC coker feed	Sh. ext.	"P"	"P"	"P"	L
RF-25	High act. bifunctional demet.			"	"P"	"P"	"P"	L
RF-100	HDS	"	"	"	"P"	"P"	"P"	L
RF-200	High act. bifunctional demet.	"	"	"	"P"	"P"	"P"	L
RF-220	"	"	"	"	"P"	"P"	"P"	L
UOP								
RCD-5	Metals tolerance, HDS	Atm. or vac. resid.	LSFO, cracking, coker feed	Sph.	41	Al_2O_3	CoMo	Contact UOP
-5A	High act. for HDS, mod. metal	"		"	46	"	"	
-7	High act. for S and CCR removal	Demet oil, DA resid.	LSFO, cracking feed	Cyl.	53	"	"	"
-8	High metals toler., high demet. mod HDS act.	Atm., vac. resid. DA resid	LSFO cracking, coker feed	"	36	"P"	"P"	"
-9	High metals toler., high demet., high HDS act.	"	"	"	37	"P"	"P"	"

Polymerization catalysts

INSTITUTO MEXICANO DEL PETROLERO								
IMP-TPC-1	High selective extrudate	Propylene	Propylene tetramer, high oct. gaso.	Cyl.	0.88*	Kieselgurgh	H_3PO_4	L
UNITED CATALYSTS INC.								
C84-01-01	Particle size	Propylene, benzene, butenes	Cumene polygaso. higher olefins	Sph.	55	Diatomaceous earth	H_3PO_4	x
C-02-04	"			"	"		"	x
C-3-01	Form, particle size	"	"	Ext.	"	"	"	x
-03-02	"	"	"	"	"	"	"	x
T-2466A	Polygas, higher olefins			Ext.	55	"P"	"	x
UOP								
SPA-1	High act. & select. larger size chamber reactor	Propylene, butenes, pentenes, benzene, toluene	Petrochemicals, gaso., tetramer, cumene, cymene	Cyl.	58	SiO_2	H_3PO_4	Contact UOP
-2	Small size for tubular reactor			"	"	"	"	"

Sulfur (elemental) recovery catalysts

ALCOA								
S-100 1/4"	Lower pressure drop	Claus feed	Withstands pressure drop due to coking & NH_3. All converters and subdew point tail gas processes.	Sph.	45	Activated Al_2O_3	Activated Al_2O_3	x
S-100 3/16"	Higher activity	Ref. or nat. gas	All converters & sub dew pt. tail gas processes	"	"	"	"	x
S-100 5/16"	Ext. low pressure drop		Withstands extreme coking & NH_3	Sph.	45	"	"	x
SP-100 3/16"	Promoted, lower pressure drop	High COS & CS_2 conversion	COS and CS_2 conv., withstands fouling due to cracking of aromatics.	"	47	Activated Al_2O_3	"P"	x
SP-100	Promoted	High COS and CS_2 conv.	"	"	"	"	"P"	x
SRU 1/2" 3/8"	Active bed supt., high physical strength	All Claus plants	High strength bed suppt. and hold down with Claus activity	"	50	"	Activated Al_2O_3	x
ARI TECHNOLOGIES								
ARI-310	Active ingredient in chelated aqueous solution	Ref. gas, SWS gas, amine tail gas, nat. gas	Elemental S	Liquid	74.8	None	Fe	L
CATALYST & CHEMICALS INDUSTRIES CO. LTD.								
CSR-2	High Claus activity	Claus react. feed gas	S	Sph.	0.84*	Al_2O_3		x
CSR-3	High hydrolysis of org. sulfide		"	"	0.87*	"		x
CSR-7	High prevention of sulfation	"	"	"	0.80*	"		x

(Continued)

Sulfur (elemental) recovery catalysts—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft,* g/cc	Carrier, support	Active agents	Availability
CRITERION CATALYSTS CO. LP								
S 949	High act. Claus, high COS/CS_2 hydrolysis		S	Sph.	0.53*	SiO_2		x
ENGELHARD CORP.								
SuReCat 2-4, 3-6	High act., low attr. prom. S resist.	Gas w/2:1 H_2S/SO_2	Purified gas, S	Sph.	50-52	"	Al, Ti, Fe oxide	x
SRC 2-4	High Claus activity	"	"	Granules	53	"	"	x
4-8	Higher than SRC 2-4 activity		"	"	55	"	"	x
LPD 5-16	Modest activity, bed support	"	"	Ext.	52	"	"	x
LPD 5-8	Modest activity, bed support only	"	"	"	52	"	"	x
LA ROCHE CHEMICAL CO.								
S-301 3x6	High porosity, high act.,	$H_2SCO_2/COS/CS_2$	S	Sph.	45	Activated	Activated	x
1/2x1/4	lowest attrition	conv.	"	"	"	Al_2O_3	Al_2O_3	x
S-201 3x6	Stand. high porosity	$H_2SCO_2/COS/CS_2$	"	"	"	"	"	x
1/2x1/4	"	conv.	"	"	"	"	"	x
S-200 3x6	Low attr., mod. CS_2 conv. act.	H_2 & SO_2 conv.	"	"	48	"	"	x
1/2x1/4	"	"	"	"	"	"	"	x
S-501 3x6	Promoted, sulfation resistant	Imp. COS/CS_2 conv.	"	"	52	"	"	x
1/2x1/4	"	"	"	"	"	"	"	x
S-701	" + thermal stability	Very high $CS_2/COS/H_2S$ conversion	"	Kloverleaf	52	"	"	x
RHONE POULENC								
CR 4-6	High pore volume	H_2S	S	Sph.	0.67*	Al_2O_3		x
DR 5-10	First generation Claus	"	"	"	0.75*	"		x
AM 4-6	Sulfation protection	"	"	"	"	"	Fe	x
CRS 21	High COS, & CS_2 conv.	"	"	"	0.71*	"	TiO_2	x
CRS 31	High COS/CS_2 conv., unsulfatable	"	"	Cyl	0.95*	TiO_2	TiO_2	x
CT 739	Catalytic incineration	H_2S & SO_2	SO_2	Sph.	0.60*	SiO_2	Fe	x
UNOCAL CORP.								
Selectox-32	Solid for oxidation of H_2S to S	Ref. acid gas, nat. gas plants, or waste treatment plants.	S, no SO_3	Cyl.	"P"	"P"	Non-noble metals	L
Selectox-33	"	"		"	"	"	"	L

Steam hydrocarbon reforming catalysts

BASF AG								
M 8-12	Hydrog. of organic S compounds	Nat. ref. gas/ LPG, lt. naphtha	Steam reformer feed	Ext.	0.72*	Al_2O_3	CoMo	x
M 8-21	"	High CO_2	"	"	"	"	NiMo	x
R 5-10	Removal of H_2S	S containing gas	"	"	1.2*	"	ZnO	x
10-20	Removal of chlorine	Cl_2 containing gas	"	Sph.	0.80*	"	Promoted	x
G 1-25	Steam ref. (gasification)	Nat./ref. gas	"	Rings	1.1-1.25*	"	Ni	x
1-25I	"	"	"	"	"	"	Promoted	x
1-25S	" + high therm. stab.	"	"	"	0.95-1.1*	"	Ni	x
G 1-50	Steam ref. (gasification)	LPG/naphtha	"	"	1.1*		Ni alkalized Spec. carrier	x
1-12/1	" (sek. reformer)	Nat./ref. gas	"	"	1.0*	"	Ni	x
1-26	"	"	"	"	1.1*	"	"	x
1-80	Autothermal steam reforming	"	Proc. gas tub. ref.	Tablets	"P"	"P"	Ni	L
K 6-10	High temp. shift conv.	Proc. gas, ex. stm. ref., partial oxid.	Proc. gas for H_2 production	"	1.0*		Fe/Cr oxide	x
6-11	" (low S/C ratios)	"	"	"	1.1*		prom. FE/Cr ox	x
3-110	Low temp. shift conv.	Proc. gas ex. HTS	"	Tablets	1.15*	ZnO/Al_2O_3	Cu	x
8-11	Shift conversion, H_2S cont. gas	Proc. gas ex. partial oxidation	"	Ext./tabs	"P"	"P"	CoMo	x
DYCAT INTERNATIONAL								
Dycat 101	S removal	Nat. gas		Granules	0.50*		Carbon	x
120	Acid gas scavenger	Tail gas, Polyprop.		Gran. ext.	0.85*		Soda lime	x
140	S removal	Gas, naphtha	S-free hydrocarbons	Sph.	70	None	ZnO	x
Dycat 873	High act. steam reforming	Nat./ref. gas	$H_2/CO/CO_2$	Rings	68-70	Al_2O_3	Ni, La	x
873F	"	LPG, lt. naphtha	"	Enhanced	64-66	"	"	x
890	"	Naphtha, gas	"	rings	68-70	"	"	x
504	High temp. shift conv.	Proc. gas, ex stm. ref., part. ox.	Proc. gas, H_2 prod.	Tablets	1.25*		Fe, Cr oxides	x
804	Methanation	CO/CO_2	"	Rings,	54-56	Refractory	"	x
844	"	High C oxide gas	H_2	Tablets	0.70*		Ni, La	x
HALDER TOPSOE								
HTZ-3	Fine desulf of stm ref. feed	CH_4/LPG/naphtha, ref. gas	S-free hydrocarbs.	Ext.	81		ZnO	x
-5	"		"	"	62		"	x
TK-250	HDS	Gas & naphtha	Deep HDS, stm. ref.	Rings	31	Al_2O_3	CoMo	x
-251	"	"	"	"	"	"	NiMo	x
-450	"	Naphtha	"	Cyl.	32	"	CoMo	x
-451	"	"	"	"	"	"	NiMo	x
HIG-1	Cl_2 absorption/HC offgases	Downstrm. HDS		Ring	58		Al_2O_3	x
RK-69	High act. stm. ref. alkalai promoted	C_1-C_4 HC ref. gas		"	65-68	$MgAl_2O_4$	Ni	x
-69 7H	"	"		7-hole rng	57-60	"	"	x
R-67	High act. stm. ref.	"		Ring	65-68	"	"	x
-67-7H	"	"		7-hole rng	57-60	"	"	x
RKNR	"	CH_4/LPG/naph. lt/hvy. offgas		Rings	"	"	"	L

(Continued)

Steam hydrocarbon reforming catalysts—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft,* g/cc	Carrier, support	Active agents	Availability
SK-12	High temp. CO conversion	Stm. ref. eff.	2-3% CO gas	Cyl.	69		Fe/Cr oxides	x
-201	" + high act., no byprod. formation at low S/C ratio	"	"	"	"			x
KK-142	" + high act. even at low S/C ratio	"	"	"	75		Cu oxides	x
LSK	Low temp. Co conv., regen Cl_2 resist	HT shift effluent	0.1-0.3% CO gas	"	66		Cu/Zn/Cr ox.	x
LK-801	Low temp. CO conv., S resistant	"	"	"	62		Cu/Zn/Al ox.	x
-821	" + high act. & long life	"	"	"	"		"	x
PK-5	Methanation	H_2, 2% CO + CO_2	H_2 w/o $CO/CO_2/O_2$ contain, contaminatins	Rings	39	Al_2O_3	Ni	x
ICI KATALCO/ICI CATALYSTS								
41-6	HDS	Gas/naphtha		Ext.	0.6*	Al_2O_3	CoMo	x
61-1	"	"		"	0.67*	"	NiMo	x
32-4	S removal	"		Sph.	1.08*	None	ZnO	x
25-3	"	Hvy. gas		"	1.0*	"	NiK_2O	x
59-3	Chloride removal	"		"	0.85*	Al_2O_3	Alkali	x
46-1	Steam reforming	Naphtha		Ring	1.15*	"	NiK_2O	x
46-4	"	"		"	1.0*	Ca/Al_2O_3	Ni	x
57-3	"	Nat./ref gas		"	1.0*	"		x
23-1,23-3	Steam reforming	Nat./ref. gas		Ring	66/75	Al_2O_3	Ni	x
23-4, 23-4M	"	"		4 hole rng	"	"	"	x
25 series	"	Hvy. nat. gas		Raschig & 4 hole rng.	66	Ca, Al_2O_3	NiK_2O	x
46-9	"	" + LPGs		Ring	"	"	"	x
71-1	High temp shift	Reformer prod. gas		Cyl.	77	None	Fe/Cr oxides	x
52-2	Low temp shift	HT shift prod. gas		"	62		$Cu/Zn/Al_2O_3$	x
53-1	"	"		"	"	"	"	x
11-3	Methanation	CO_2 removal		"	70	Ca, Al_2O_3	Ni	x
11-4	"	"		"	75	"	"	x
UNITED CATALYSTS INC.								
C11-2, -2S	Steam reforming	Nat. gas-C_3H_3 feed	H_2, 65-72%	Raschig rings	50-65#	Ca, Al_2O_3	Ni	x
C11-9-01 to 04/06	Composition differs	"	"	rings	70-95#	Refractory	"	x
C11-09 HGS	"	"	"	Wheels	70	Al_2O_3	"	x
G90A, B, C	"	"	"	Raschig rings	50-60#	"	"	x
G56A, B, H	"	"	"	Raschig rings	55-60#	Ca, Al_2O_3	"	x
G-91 HGS	High act., K promoted			Ring/whls	50	Refractory	"	x
C11-9-061	"	C_4H_{10}/naphtha	"	"	80-85#	Refractory	"	x
C11-9-062	"	"	"	"or HSGA"	(70 HSGA)	Al_2O_3	"	x
C11-N/C11-NK	" and split loading	"	"	Rasching rings	67	"	"	x
# Bulk density depends on size of rings and Ni content.								
C7-2	Desulf., metal content	NG steam ref. feed	S free streams	Ext.	70	Binder	ZnO	x
-4	"			"	80	"	"	x
G-72D	"	"	"	"	70	"	"	x
G-1	Conv. of S compounds to H_2/H_2S absorption	NG streams	"	Tablets	"P"	"P"	"P"	x
C12-3-05	High temperature shift conv.	Proc. gas ex. reformer	CO-free gas	"	65		Fe/Cr	x
G3	"		"	"	70		Fe/Cr	x
C18 HC	Low temp. shift conv.	Process gas	"	"	80-85		Cu	x
HCS	"	"	"	"	70-80		"	x
G66A	"	"	"	"	80		"	x
66B	"	"	"	"	90/85		"	x
C13-3	Methanation (diff. form & metal content)	"	H_2 w/o CO/CO_2	"	65	Refractory	Ni	x
-4		"	"	Sph.	55	"	"	x
-5	"	"	"	"	60	"	"	x
C25-2-02	CO/H_2O shift, H_2S containing gas	Proc. gas/part. ox	"	Ext. tabs	40-47	Al_2O_3	CoMo	x
G65		"		Tablet		"	"	x
G65RS	Withstands elevated temp.			Ext. tab.	58(ex)60(T)			
G87	Methanation	"		Ext.	60	"	"	x
87RS	"	"		Sph.	55	"	"	x
PROCATALYSE								
MT 15	CO methanation		Pure H_2	Sph.		"	Ni	x

Sweetening catalysts

ARI TECHNOLOGIES								
ARI-100	Slurry of act. metal	LPG, gaso.	Merox, Mericat/lq/lq	Powder		None	"P"	x
-100L	"	"	"	Liq. susp.		"	"	x
-100EXL	Solution of act. metal	"	"	Liquid		"	"P"	x
-120	Powder	LPG/gaso./kero/jet	Merox fixed bed	Powder		"		x
120L	Slurry of act. metal	"	"	Lq. slurry		"		x
ICI KATALCO/ICI CATALYSTS								
75-1	Gas phase H_2S removal	NG, ref. gas., reformate		Sph.	52		ZnO	x
85-1	Liq. phase H_2S removal	LPG/NGL/kero. gaso./lubes		"	52		"	x
INSTITUTO MEXICANA DEL PETROLEO								
IMP OM-1	Sweet in homogenous phase	LPG, gaso.		Powder			Co	L
OM-2	Sweet in heterogenous phase	Gaso., turbine fuel		"			"	L
PROCATALYSE								
LCPS 30	Act. agent dissolved in water	LPG, gaso., jet.		Liquid			"P"	x
UOP								
MEROX FB	Active agent dispersed in water	Lt. nap. to diesel	Merox, fixed bed	Lq. slurry			"P"	L

(Continued)

Sweetening catalysts—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft,* g/cc	Carrier, support	Active agents	Availability
MEROX WS	"	C_1 through LSR, gaso.	Merox, liq/liq.	Liquid sol.			"P"	L
MEROX No. 10	Active agent supported on activated carbon	Lt. nap. to diesel	Merox	Granular		Activated carbon	"P"	L
MEROX No. 8		"	"	"		"	"	

Claus unit tail gas treatment catalysts

AKZO CHEMICALS INC./NIPPON KETJEN (All catalysts available as off-site presulfided)								
KF-124 LD				Cyl.	38	Al_2O_3	CoMo	x
KF-124 HD				"	48	"	"	x
KF 165				Cyl.	48	"	"	x
ALCOA								
S-100 1/8"	Sub dew pt. Claus tail gas			Sph.	46		None	x
ARI TECHNOLOGIES								
ARI-310	Active ingredient in chelated aqueous solution	Claus tail gas, amine acid gas	Elemental S	Liquid	74.8	None	Fe	L
CRITERION CATALYSTS CO. LP								
N-25, N-39	(See Unocal Claus unit listing)							
HDS-2		Tail gas		Cyl.	36	Al_2O_3	CoO/MoO_3	x
Selectox-33	(See Unocal Claus unit listing)							
C 099	(Inciner. of Claus, SCOT tail gas	Claus, SCOT tail gas		Sph.	0.78*	Al_2O_3		x
599	Suppt. funct., rpl. ceram. matl			"	0.53*	"		x
234	Conv. of S compounds to H_2S	Claus tail gas		Cyl.	0.77*	"	CoMo	x
534	"	"		Sph.	0.77*	"	"	x
ICI KATALCO/ICI CATALYSTS								
403	COS/CS_2 conv., high stab.	Claus tail gas	H_2S to recycle	Cyl.	32	"	CoO/MoO_3	x
LA ROCHE CHEMICALS								
S-301 3x6	High porosity, low attrition	Sub dew pt. Claus tail gas		Sph.	45	Activated Al_2O_3	Activated Al_2O_3	x
5x8	"			"	"			x
S-201 3x6	Std. high porosity alumina	"		"	"	"	"	x
5x8	"	"		"	"	"	"	x
S-701	Promoted sulfur recovery	High CS_2/COS conv.	TGCU process	Kloverleaf	52	"P"	"P"	x
PROCATALYSE								
TG 103	Tot. hydrog. of S compounds	Claus tail gas	H_2S	Sph.	0.75*	Al_2O_3	CoMo	x
105	"	"	"	"	"	"	"	x
RHONE POULENC								
A 2.5	Catalysts for Sulfreen	Claus effluent		Sph.	0.77*	Al_2O_3		x
CRS 31	Oxidation of H_2S to S	"		Ext.	0.95*	TiO_2		x
AM 2.5	Catalyst protection (Sulfreen)	"		Sph.	0.82*	Al_2O_3	Fe	x
UNOCAL CORP.								
Selectox-33	Solid for oxidation of H_2S to S	Claus tail gas		Cyl.	"P"	"P"	Non-noble metals	L
Selectox-32	catalytic incineration of SO_2	"		"	"P"	"P"	"	L
N-25	Hydrolysis of gas S compounds	"		"	"P"	"P"	"P"	L
N-39	"	"		"	"P"	"P"	"P"	L
N-239	"	"		"	"	"	CoMo	L
UNITED CATALYSTS INC.								
C29-2-02		Claus tail gas		Ext.	37	Al_2O_3	CoMo	x
-2-03	Stabilized carrier(SC)	"		"	"	"	"	x
-2-04	SC + lower metals	"		"	"	"	"	x
-3-03	SC + spherical form (SF)	"		Sph.	55	"	"	x
-3-304	SC, SF + lower metals	"		"	50	"	"	x
-4-03	Composition, SC, SF	"		"	55	"	NiMo	x
N-239	(See Unocal Corp., Claus unit Listing							
G-41P	COS hydrolysis	High CS_2/COS conv.		Ext.	34-38	Al_2O_3	"P"	x

Other refining catalysts

AKZO CHEMICALS INC.								
K-25	Octane improver, attr. resist.	High oct., high LPG olefinicity	High oct. gaso.	Powder		SiO_2/Al_2O_3	ZSM-5	x
BAYER AG								
OC-1038	Hydrog. & etherification, condensation, dehydrolization	Methanol & C_5 cracked fraction, acetone	TAME MIBK	Beads	1.2*	Polystyrene DVB	Sulfonic acid groups, Pd	L
AC-10FT	Oligomerization	Isobutene	Di/tri-isobutene	Powder	1.3*	copolymersate		L
BP								
CDW-12	Product of specialty/lube oils	Dist./raffinate	High quality specialty, lube oils	Cyl.		Zeolite	Noble metal	L
-14	Imp. low temp. properties of mid distillates	Kero., gas oils	Jet, kero., diesel, heating oils	"		"	"	L
FF-62	Lube oil color improvement	Solvent ref. lubes	Finished lubes	Sph.		"P"	"P"	L
CHEVRON RESEARCH CO.								
GC-500	Selective arsine removal	Lt. HC gas	Arsine free feed	Cyl.	34-35	Al_2O_3	"P"	L
-501	"	"	"	"	"	"	"	L
CRITERION CATALYSTS CO. LP								
TSR-10	(See Unocal "other" listing)							
SOAR-100	"							
C 538	CO/H_2O shift reactors	Treatment of syngas		Sph.	0.82*	Al_2O_3	CoMo	x
ENGELHARD CORP.								
HZ-1	Gas oil cracking, Houdriflow TTC. HZ-1 is octane catalyst	HGO	Olefins, LPG, LCO	Ext.	0.95*	In situ zeo.	Zeo./no RE	x

(Continued)

Other refining catalysts—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft,* g/cc	Carrier, support	Active agents	Availability
HZ-PLUS	High attrition resistant	"	"	"	"	"	"	x
EMCAT-100	RE exchanged version, max. liq. yield, HCC, TOC xylenes +	HGO/toluene/ mixed C_9 transalky	LPG/gaso/LCO xylene, benezene	"	"	"	Zeo. RE exchanged	x
EMCAT-80	Lower activity version	"	"	"	"	"	"	x
HZ-PLUS P	Prepromoted products for max. CO burning.	HGO cracking	LPG/gaso/LCO	"	"	"	Zeo. no RE	x
EMCAT-100 P	"	"	"	"	"	"	Zeo RE exch.	x
HRD-264	Vapor phase S removal	Naphtha reformer	S-free naphtha	"	70	Al_2O_3	"P"	x
NI 3238	Liq. phase S removal	"	"	Cyl.	50	"	Ni	x
HALDOR TOPSOE								
HTZ-3	Fine desulfur. of steam ref. feed	Methane/LPG/ naphtha, ref. gas	S-free hydrocarbon	Ext.	81		ZnO	x
HTZ-5	+ low temp., low S	"	"	"	62		"	x
TK-250	HDS	Gas & naphtha	Deep HDS/stm. ref.	Rings	31	Al_2O_3	CoMo	x
-251	"	"	"	"	"	"	NiMo	x
-450	"	Naptha	"	Cyl.	32	"	CoMo	x
-451	"	"	"	"	"	"	NiMo	x
HIG-1	Cl_2 absorption from HC offgases	Downstrm. HDS		Ring	58		Al_2O_3	x
RK-69	High act. stm. ref., alkalai promoted	C_1-C_4 HCs, ref. gas		"	65-68	$MgAl_2O_4$	Ni	x
-69-7H		"		7-hole rng	57-60	"	"	x
R-67	High act. stm. ref.	"		Rings	65-68	"	"	x
-67-7H	"	"		7-hole rng	57-60	"	"	x
RKNR	"	CH_4/LPG/naph/ hvy offgas		Rings	"	"	"	x
SK-12	High temp. CO conv.	Steam ref. effluent	Gas w/2-3% CO	Cyl.	69		Fe/Cr oxides	x
-201	" + high act., no byprod. formation at low S/C ratio	"	"	"	"		"	x
KK-142	" + high act. even at low S/C ratio	"	"	"	75		Cu oxides	x
LSK	Low temp. CO conv., regen., chlorine resistant	HT-shift effluent	Gas with 0.1-0.3% CO	"	66		Zn, Cr oxides	x
LK-801	"	"	"		62		Cu,Zn,Al ox.	x
-821	" + high act., long life	"	"	"	62		"	x
PK-5	Methanation	H_2 w/o CO/CO_2, up to 2% contaminants		Rings	39	Al_2O_3	Ni	x
ICI KATALCO/ICI Catalysts								
75-1	Cold desulf. of gaseous HCs	NG/naphtha/ H_2 off gas/	H_2S free HCs	Sph.	52		ZnO	x
85-1	Cold desulf. of liquid HCs	LPG/NGL/kero./ lube oils	"	"	52		"	x
59-3	HCl removal	NG/H_2 offgas/cat. ref.	Chloride free HCs	"	52	Al_2O_3	Activated	x
32-4	Desulf. of steam ref. feed	CH_4/LPG/naphtha/ ref. gas	H_2S-free HCs	Sph.	75		ZnO	x
INSTITUTO MEXICANO DEL PETROLEO								
IMP-TPC-1	Cumene production	Benzene, propane propylene	Cumene	Cyl.	0.86-0.95*		Fe/K, oxides	L
IMP-ES-1	Styrene production	Ethylbenzene	Styrene	Cyl.	1.0-1.4*		"	L
INTERCAT CORP.								
V-CAT	Attrition resisitant additive to selectively demobilize Vanadium			MS		Separate addition via feed system		
BCA-105	Selectively cracks hvy. cycle oil into LCO and gasoline			MS		Blend with FCC catalyst		
KALI-CHEMIE AG								
KC PERL-KATOR series	Moving bed cat. cracking in TCC, Houdriflow	Gas oils		Beads		SiO_2/Al_2O_3	Acid sites	L
D 1	Hvy. feeds, gaso. yields secondary	HGO/VGO	C_3/C_4 olefins	"	0.80*	SiO_2, Al_2O_3	Amorphous alum. silicate	x
D8	Imp. yield select. more gas., less avg. gas & coke	"	7050, dist.	"	0.90*	"	"	x
D9A	High act. version imp. stab.	"	"	"	"	"	"	x
D10A	Max. Co burning in kiln gas CO combustion promoter	"	"	"	"	"	"	x
D 11	High octane	"	High oct. gaso.	"	"	"	"	x
D 12	High gaso. selectivity	"	" + low coke low coke yields	"	"	"	"	x
D 14	"	"	High oct. gaso.	"	"	"	"	x
XP-catalyst	Xylenes-plus process	Transalky, disproportionation of toluene	Xylenes/benzene	"	"	"	RE exch. zeo.	L
Beadcat PK series	Xylenes Isom.	Xylenes	p, o-xylene	"	0.8*	"	Acid sites	x
PROCATALYSE								
RS 103	Oxidation of S compounds	S-H_2S/COS/ CS_2/RSH	SO_2	Sph.		Al_2O_3	Metallic oxides	x
FF 62	Lube oil hydrofinishing	Extracted lube	Finished base oil	Sph.		"		L
HR 346	Wax hydrotreating	Slack wax	Food grade wax	Cyl.		"	NiMo	x
UNOCAL CORP.								
TSR-10	Trace S removal	Naphthas	Cat. ref. feed	Sh. ext.	"P"	"P"	"P"	L
TSR-11	"	"	"	"	"P"	"P"	"P"	L
SOAR-100	Arsenic removal	Shale oil, coal liq.	Low arsenic prod.	"	"P"	"P"	"P"	L
UNITED CATALYSTS								
C53-2-01	COS hydrolysis	FCC P-P gas		Ext.	28-32	Al_2O_3	PTS	x
G-132	Arsine removal	"		Tab	75-85		Cu	x
C28-1-01	S removal	Naphthas, cat. ref. feed		Ext.	45-50	"P"	"P"	x

(Continued)

Other refining catalysts—continued

Catalyst designation	Primary differentiating characteristics	Application (feedstock)	Application (product)	Form	Bulk density compacted, lb/cu ft,* g/cc	Carrier, support	Active agents	Availability
TSR-11	(See Unocal "other" listing)		–					L
C125-1-01	HCl removal	H_2 offgas cat. ref.		Ext.	47-53	Zn	Ca	x
G-92	"	"		Sph.	49-55	Al_2O_3	Na	x
UOP								
TA-4	Transalkylation	Toluene and C_9 aro.	Benzene, xylenes	Cyl.	45	"P"	"P"	Contact
DEH-5	Paraffin dehydro.	C_6-C_{20} paraffins	C_6-C_{20} mono-olefins	Sph.	21	Al_2O_3	Pt	UOP
DEH-6	Lt paraffin dehydrog.	C_3-C_5 paraffins	C_3-C_5 mono-olefins	"	"	"	"P"	"
DEH-7	Paraffin dehydrog.	C_6-C_{20} n-paraffins	C_6-C_{20} mono-olefins	"	20	"	"P"	"
A-2	Alkyl. of benzene w/ethylene	Ethylene, benzene	Ethylbenzene	"	35	Al_2O_3	"P"	"

Methyl tertiary butyl ether (MTBE) catalysts

BAYER AG							
K2611	Etherification	Methanol/C_4 raffinates	Beads	1.2*	DVB copoly-merisate Polystyrene	Sulfonic acid groups	L

Combustion Promotors (FCC)

Catalyst designation	Primary differentiating characteristics	Application	Additive to or component of catalyst	Form	Carrier, support	Active agents	Available
AKZO CHEMICALS INC.							
KOC-15	High SA stability	CO combustion		Powder	SiO_2/Al_2O_3	Pt	x
-18	"	"		"	"	"	x
AMBUR CHEMICAL CO. INC.							
CCA-1	Highest activity bimetallic	CO combustion	Additive	MS	HiPur. Al_2O_3	Pt., Pd	x
-8	High activity, bimetallic	"	"	"	"	"	x
-6	Medium act., bimetallic	"	"	"	"	"	x
-850	Highest act., monometallic	"	"	"	"	Pt	x
-700	High act., monometallic	"	"	"	"	"	x
-500	Medium act., monometallic	"	"	"	"	"	x
-350	Lower act., monometallic	"	"	"	"	"	x
CATALYSTS & CHEMICALS INDUSTRIES CO. LTD.							
SP-10S	Solid CO combustion promoter	FCC feed	Additive	Sph.	Al_2O_3	"P"	x
DAVISON CHEMICAL DIVISION, W.R. GRACE & CO.							
CP-3	High activity	Partial, comp. CO comb	Additive	MS	"P"	"P"	x
-5	"	"	"	"	"P"	"P"	x
CPA	"	"	"	"	"P"	"P"	x
ENGELHARD CORP.							
COCAT-1	Low activity	Partial CO comb.	Additive	MS	SiO_2/Al_2O_3	Prec. metal	x
-5	High activity	Comp. CO comb.	"	"	"	"	x
PROCAT 500	"	"	"	"	"	"	x
COCAT-7	High act., imprvd. support	"	"	"	"	"	x
PROCAT 700	"	"	"	"	"	"	x
FILTROL CORP.							
FILTROX A	Low activity	CO combustion	Additive	MS	SiO_2/Al_2O_3	Pt	x
C	Med. activity	"	"	"	"	"	x
H	High activity	"	"	"	"	"	x
INTERCAT CORP.							
COP-850	Pt. content	CO combustion	Additive	MS	Al_2O_3	Pt	x
-550	"	"	"	"	"	"	x
-350	"	"	"	"	"	"	x
KATALISTIKS INTERNATIONAL							
KCP-800	Act. in high severity appls.	Par/full CO comb. additive or blend	Add. or blend	"	"	Prec. metals	x
-801	Low severity operations			"	"	"	x
UOP							
UNICAT CI-3	Active metal	CO combustion	Additive	Powder	Al_2O_3/SiO_2	Pt	x
W.R. GRACE CATALYSTS PTY. LTD. (See Davison Chemical Co. combustion promoter listing)							

Sulfur oxides reduction catalyst (FCC)

Catalyst designation	Characteristics	Form	How introduced to FCC system
AZKO CHEMICALS INC.			
KDSOX	Low regenerator SOX emissions, attrition resistance	Powder	Additive
CHEVRON RESEARCH CO.			
Transcat	Fully fluidizable powder	Added to FCC cat.	Separate add. to FCC
DAVISON CHEMICAL DIV. W. R. GRACE			
Soxtrap-520	Reduces regen flue gas SOx emissions	MS	Solid additive which can be added separately or pre-blended with FCC catalyst
ENGELHARD CORP.			
ULTRASOX	Typical FCC particle	Typical FCC cat.	As fresh makeup
MAGNASIV 370S	"	"	"
INTERCAT CORP.			
LO-SOX	Attrition resistant additive to control SOx emissions	MS	Separate additive via INTERCAT addtive feed system
KATALISTIKS INTERNATIONAL			
DESOX	Removes SOx from FCC flue gas, releases as H_2S	MS	Added or blended with FCC catalyst
W.R. GRACE CATALYSTS PTY. LTD. (See Davison Chemical Division SOx listing)			

Worldwide Construction

Lou Ann Thrash
Director of Editorial Surveys

Here are the major worldwide construction projects in processing and pipelining, showing capacities, contractors, estimated costs, and time of completion. The total capacity figure in "Remarks & completion" column includes capacity of the project listed. Where no such figure is given, the project listed is a new unit.

Refineries — WORLDWIDE CONSTRUCTION

*Designates projects listed for the first time in the Journal.

Company and location	Project	Capacity (b/d)	Remarks & completion
	UNITED STATES		
Alaska Pacific Refining Inc.—Valdez	New ref	120,000	UOP. $700 MM. Late 1991.
	Vacuum	65,000	Late 1991.
	Cat reform	46,000	Late 1991.
	Hydrocrack	45,000	Resid upgrade. Late 1991.
	Hydrotreat	55,000	Naphtha desulf. Late 1991.
	Hydrotreat	12,000	Straight-run dist. Late 1991.
	Sol. Extr.	22,000	Late 1991.
	Hydrogen	60 MMcfd	Partial oxidation. Late 1991.
Amoco Oil—Whiting, Ind.	Alky	....	Upgrade. Litwin, BMW. 1990.
ARCO—Ferndale, Wash.	Coke	3,000	53,000 total cap. Parsons/Betchel. Summer 1990.
	Coker	....	Light Ends. Parsons/Bechtel. Fall 1991.
	Revamp	....	Olefin Coker. Engr: Parsons. 1990.
	Expan.	....	Delayed Coker. Engr: Parsons. 1990.
Los Angeles	Revamp	....	Relief valve audit. Under construction. Engr: Parsons. $25 MM Completion: 1991.
Ashland Petroleum—Catlettsburg, Ky.	Lubes	600	8,500 total cap. Fall 1989.
	Expan	3,000	Methyl Tertiary Butyl Ether plant. Contr: Foster Wheeler. Mid 1990.
BP Oil Company—Toledo, Ohio	Platform	45,000	CCR unit.
	cat reform	120,000	$102.5 MM. Engr: M.W. Kellogg. 1991.
Coastal Eagle Point—Westville, N.J.	Isom	9,500	C_5-C_6 feed. Lic: UOP. Engcon: United-Stearns. Feb. 1990.
Champlin Refining & Chemicals, Inc.—Corpus Christi, Tex.	Revamp	56,000	62,000 total capacity. Planning stage. Completion: 1991.
Conoco Inc.—Lake Charles, La	Coke	804	Expansion. $20 MM. Early 1990.
Diamond Shamrock R&M—McKee, Tex.	Expan.	25,000	reformer. spring 1990. Fluor Daniel
Sunray, Tex.	Cat reform	15,000	UOP. Contruction: Fluor Daniel. Early 1990.
Three Rivers—Tex.	Crude	5,000	Staff. 1990.
Fina Oil & Chemical—Fort Arthur, Tex.	Modernize	....	$190 MM over all. Includes cat cracker, atmospheric crude tower, and saturate liquid recovery unit. FW and UOP. 1991 on all units.
Kerr-McGee—Wynnewood, Okla.	Cat reform	12,500	Semi bimcat. Howe-Baker. Feb. 1990.
	Hydrotreat	3,500	Feed pretreat. Feb. 1990.
Marathon—Garyville, La.	ROSE	30,000	MW Kellogg. $25 MM. Nov. 1989.
*Texas City, Tex.	Distr. Control System	....	Contr: Fluor. 1990.
*Robinson, Ill.	Alky Feed Pretreaters	14,000	Contr: Fluor. 1990.
Mobil Oil Corp.—Paulsboro, N.J.	Lube	3,800	blending. Pritchard. 1991.
Murphy Oil USA Inc.—Meraux, La.	Modernize	....	$125 MM. Includes heat exchangers, catalyst cooling system, LPG recovery unit, C_3-C_4 splitter. 1991.
Paramount Petroleum Corp.—Paramount, Calif.	Isom	4,500	C_5-C_6 feed. Early 1990.
	Expan.	8,000	JP-4 Treater. Egr: Ben Holt. Oct. 1989.
Phillips 66 Old Ocean, Tex.	Expan.	50	MMBTU/HR. Environmental Control Unit.
Shell Oil Co.—Martinez, Calif.	Revamp	....	Refinery. Engr. stage. Engr: Parsons. : 1992.
Wilmington, Calif.	Revamp	....	Refinery. Engr. stage. Engr: Parsons. 1992.

REFINERIES

Company and location	Project	Capacity (b/d)	Remarks & completion
Sohio Oil Co.—			
Toledo, Ohio	Cat reform	....	Planning. Eng: MW Kellogg. Lic: UOP. $60 MM. 1991.
Star Enterprise—			
Port Arthur, Tex.	Upgrade	....	Resid unit. Under study. Completion: 1992.
	Alky	14,000	Fluor Daniel. 1990.
*Convent, La.	Isom	12,500	Eng: Fluor Daniel. 11/89.
	LPG Recovery	2316	Engr: Pro-Quip. 4/90.
*Delaware City, DE.	Alky	9,000	Engr. Pritchard. 11/90.
Sun Co. Inc.—			
*Marcus Hook, Pa.	Hydrotreat	13,000	Engr. Phase 1990.
Sun R&M Co.—			
Tulsa,	Expan.	...	MEK Compression.
	Expan.	....	#2 Air Station.
Texaco R&M—			
*Wilmington, Calif.	Hydrotreater	30,000	Eng. stage. Fluor Daniel. 1990.
	Hydrogen	15 MMcfd	
Three B Oil Co.—			
Wickett, Tex.	Upgrade	8,000	oil. $20 MM.
Total Petroleum Inc.—			
Alma, Mich.	Hydroref	2,000	Mid dist. Litwin. Dec. 1989.
Union Pacific Resources—			
Wilmington, Calif.	Hydrotreater	35,000	Eng. stage. Fluor Daniel. Aug. 1990.

ABU DHABI

Abu Dhabi National Oil—Ruwais and Umm Al Nar	Upgrade	....	300,000 b/d total combined capacity for both Ruwais and Umm Al Nar. Includes isom unit, visbreaker, hydrotreaters. $400 MM combined cost. 1991-92.

ALGERIA

Naftec—Skikda	Cat reform	30,000	JGC, C. Itoh. End 1992.

AUSTRALIA

Ampol Refineries Ltd.—			
Brisbane, Queensland	Cat reform	5,000	19,000 total cap. Semi concat. Davy McKee. 1991.
	LPG	894	recovery cryogenic. Linde. 1990.
Caltex Refining—Kurnell	FCC	....	Revamp. Con: Stone & Webster. $10.5 MM.
Shell Refining (Australia) Pty. Ltd.—			
Geelong	Cat Crack	34,000	Long Residue Catalytic Cracking. 1992.
Clyde	Cat Reform	19,800	CCR. 2nd Qtr. 1991.

BELGIUM

Fina Raffinaderij Antwerpen N.V.	Platfomer	45,000	Naphtha.Lic: UOP. CCR tech.

BOLIVIA

YPF—Cochabamba	FCC	6,000	New.

BRAZIL

Petrobras—			
North Eastern	New ref	124,000	Planning.
Araucária-Parana	Hydrocrack	28,400	Resid upgrade. Planning.
	Hydrotreat	28,400	Dist. Staff. 1992.
	Hydrogen	28.0 MMcfd	Fuel gas. Staff. 1992.
Betim, MG	Coke	5,864	Staff/Promon. 1991.
Canoas, RGS	Crude	108,600	Planning. Staff.
	Vac	54,300	A. Araujo. 1990.
	Hydrotreat	22,700	SR Dist. Staff. 1992.
	Hydrogen	10.5 MMcfd	Steam Naphtha Reforming. Staff. 1992.
Cubatão, SP	Crude	120,600	Planning.
	Vacuum	69,300	Planning.
	Hydrotreat	45,600	SR dist. Staff. 1991.
	Hydrogen	28.7 MMcfd	Fuel gas. Staff. 1991
Duque de Caxias	Hydrotreat	28,500	Dist. Staff. On hold.
Mataripe	Crude	138,700	Staff/A. Araujo. $300 MM. 1991.
	Vac	69,300	Staff/A. Araujo. 1991.
	Hydrocrack	39,800	Resid upgrade. Planning.
	Solvent extract	22,700	Planning.
	Hydrogen	28.3 MMcfd	Steam meth. reform. Planning.
Paulínia	Delay coke	18,400	Staff. 1992.
	Delay coke	18,400	Planning.
	FCC	42,700	82,500 total cap. Under const. Kellogg/Promon/Staff. 1991.
	Hydrocrack	28,400	Resid upgrade. Staff. 1991.
	Hydrotreat	56,900	Dist. Staff. 1992.
	Hydrogen	33.5 MMcfd	Fuel gas. Staff. 1992.
	Hydrogen	28.0 MMcfd	Planning.

BRUNEI

Brunei Shell Petroleum Co.—			
Seria	Cat Reform	5,600	end 1991.

CANADA

Consumer's Cooperative Refineries Ltd.—Regina	HF alky	5,000	1990.
Husky Oil Operations Ltd.—Lloydminister	Heavy oil	54,000	Hydrocracker (HRI) and delayed coker (FW). $1.3 billion. Sept. 1992.
	Hydrogen	26 MMSCFD	psa. engr: Linde. 1990.
	Hydrogen	7.3 MMSCFD	psa. engr: Linde. 1990.
Petro-Canada—			
Clarkson, Ont.	Isom	....	Stone & Webster.
Fort McMurray	Crude	70,000	$4 billion. Planned.
Dow Chemical—			
Fort Saskatchewan	New Ref	70,000	120 million. natural gas liquids fractionation plant.
*Suncor—Ontario—	FCC	19,000	Replaces existing unit. MW Kellogg.
Ultramar Canada Inc.—			
Quebec City, Que.	Vac	....	$100 MM. 1990.
	Isom	....	New. 1990.

CHILE

Petrox S.A. Refineria de Petroleo—Talcahuano	Cat reform	500	4,500 total cap. Semi bimcat. UOP. 1991.
Refineria de Petroleo Concon—Concon	Hydrocrack	8,500	Dist. upgrade. Planned. Jan. 1992.

CHINA

Erlian, Inner Mongolia	New ref	20,000	1991.
Sinopec—Fushun,			
Liaoning	Alky	2,010	Stratco tech. Turnkey: Bechtel. 1989.
Huang Pu	HDT-reform	40,200	Under const. CTIP.
	Demex	16,000	Vac resid. Design: UOP.

REFINERIES

Company and location	Project	Capacity (b/d)	Remarks & completion
CHINA			
Erlian, Inner Mongolia	New ref	20,000	1991.
Sinopec—Fushun, Liaoning	Alky	2,010	Stratco tech. Turnkey: Bechtel. 1989.
Huang Pu	HDT-reform	40,200	Under const. CTIP.
	Demex	16,000	Vac resid. Design: UOP.
CHINA, TAIWAN			
Chinese Petroleum Corp.—Kaohsiung	Cat reform	30,000	95,000 total cap. Semi bimcat. JGC. Mid 1991.
	Resid HDS	30,000	JGC/CTCI. Mid 1990.
	hf Alky	2,500	Mid 1992.
	Dimersol	500	Mid 1992.
	Hydrogen	35.0	Steam meth. reform. Mid 1990.
	Resin Crack	25,000 MMcfd	Mid 1991.
	Resin HDS	30,000	Mid 1993.
	New Plant	20,000	1991. Hydotreat gas oil no. 8 HDS
	Isom	19,000	Mid 1993.
	Crude	95,000	Mid 1993.
Ta Lin Pu	Resid crack	25,000	Kellogg/CTCI. 1990.
	Hydrogen	35.0 MMcfd	Steam meth. reform. Mid 1990.
	New Plant	60,000	1992. No. 5&6 Reforming unit.
	New Plant	380	1991. Tame.
Tao-yuan	Resid HDS	15,000	45,000 total cap. Chiyoda/CTCI. Mid 1990.
	Hydroref	15,000	45,000 total cap. Mid dist. Mid 1990.
	Hydrogen	17.5 MMcfd	62.5 total cap. Steam meth. reform expan. Eng: Chiyoda. Mid 1990.
	JP-A1 HDS	11,000	Mid 1991.
	Isomer	6,000	Mid 1992.
	Hydrotreat	24,000	Mid 1994.
	Crude	66,500	Mid 1993.
	Cat Reform	19,000	Mid 1994.
COLOMBIA			
Ecopetrol—Barrancabermeja	Crude	20,000	170,000 total cap. TPL. 1990.
	Expan	8,000	FCCU in the Engineering stage. Design: Air Product & Chemical Inc.. 1991.
	Expan	4,700	Solvent Dewaxing Lube (MEK). Engineering stage. Engr: Badger. Tech: Texaco. Completion: 1990.
CZECHOSLOVAKIA			
Slovnaft—Bratislava	Hydrocrack	16,960	Eng. Snamprogetti. 1990.
DENMARK			
A/S Dansk Shell—Fredericia	Isom	6,000	Early 1990.
	Expan	5,864	Naptha IsoSiv. Engr: Comprimo. 1990.
Norske Shell—Sola	Expan	....	TIP Kero Merox
EGYPT			
Alexandria Petroleum.—(El-Mex) Alexandria	Crude	42,500	141,750 total cap. Planning.
Cairo Oil Refining.—Mostorod	Crude	39,700	164,760 total cap. Planning.
El Ameria Oil Refining—El Ameria	Crude	42,500	102,840 total cap. Planning
FRANCE			
Esso SAF—Port Jerome	FCC	4,000	24,000 total cap. Feb. 1990.
Elf-France—Mormant	Hydroisom	2,200	Methane.
	FCC	....	Engr: Technip. 1990.
	Fraction	....	naphtha fractionation from FCC unit. Technip. 1989.
Shell—Berre L'Etang	Expan	16,000	Naphtha fractionation. Technip. 1990.
GERMANY, WEST			
Deutsche Shell AG—Wintershall AG—Lingen	Revamp	5,000	Reformer. 20,000 total. Eng. stage. Edeleanu. 1990.
*Henkel—Dusseldorf	New Ref.	41,933	Caustic So^2 scrubbing. Linde. March 1991.
*Huls AG—Marl	Hydrogen	1.6 MMcf/hr	$21 MM. Uhde.
*Mobil Oil AG—Oberrheinische Mineralolwerke GmbH—Karlsruhe	MTBE	2,812	Engr. Edeleanu GmbH.
Sachtleben—Homberg	New Ref.	7,863	Solinox So_2-scrubbing. Linde. March 1990.
GREECE			
*Hellenic Aspropyrgus Refinery S.A.—Aspropyrgos	Hydrotreat	9,600	31,800 Total Cap. Asprofos. Jan. 1990.
	Hydroref	9,700	Gas Oil Desif. 25,300 Total Cap Planned.
*Motor Oil (Hellas)—Corinth	Revamp	5,300	hydrotreater, catalytic. Dec. 1990.
	Revamp	3,800	Cat Reformer. Dec. 1990.
INDIA			
Hindustan Petroleum Corp.—Mangalore	New ref	60,000	Proposed. $225 MM. Birlas 27%, Hindustan 26%.
Indian Oil Corp.—Assam	New ref	600,000	$665 MM. Proposed. 1994-95.
Barauni	Cat reform	6,290	Proposed. Late 1992.
Digboi	Cat reform	1,950	Proposed. Late 1992.
	Modernize	....	$85 MM.
Gujarat	Vacuum	49,700	96,700 total cap. M/S Engineers India. Early 1992.
	Visbreak	11,350	30,250 total cap. Early 1992.
	Crude	10,240	early 1992.
	Residual	25,470	upgrading. early 1992. M/S Chevron USA.
*Madras Refineries Ltd.—Manali	lubes	301	Additives plant. Joint venture with Chevron.
	Hydrocrack	25,000	Resid upgrade. Approved. Early 1992.
Tata-Indian Oil Refineries Ltd.—Karnal	New ref	120,493	Planned. $1.1 billion. 1992.

REFINERIES

Company and location	Project	Capacity (b/d)	Remarks & completion
INDONESIA			
Pertamina Exor I— West Java	New ref	125,000	1993.
IRAN			
Arak	New ref	150,000	$1.8 billion. JGC. Engr. stage. Dec. 1992.
Esfahan	Lube complex	3,618	Eng. stage. FW Italiana.
IRAQ			
Oil Refineries Administration	New ref	150,000	Technical studies under way.
*Technoexport— West Qurna	Crude	200,000	Eng: TPL. July 1990.
ITALY			
Esso Italiana—Augusta	Cat reform	11,100	19,100 total cap. Semi bimcat. 1991.
	Hydrotreat	4,200	18,200 total cap. Feed pretreat. 1991.
ICIP—Mantova	Hydrotreat	3,000	Dewax. Planned. 1990.
Raffineria Siciliana Srl— Gela	Coking	19,000	Delayed. Snam. 1990.
	FCC	218 t/h	Turboexpander of plant. Snam. 1990.
Soc. Ener. Montedison— Priolo	Hydrocrack	5,700	Dewax. Late 1990.
Stanic Spa— Livorno	Expan.	90,600	Atmospheric Crude Distillation. Snam. 1990.
Tamoil—Cremona	Hydrocrack	5,500	Dewax. Design: Akzo-Labofina. Planned. Sept. 1990.
JAMAICA			
Petrojam Ltd.—Kingston	Vacuum	12,350	14,250 total cap. 1992.
	FCC	7,200	1992.
	Polymeriz	418.5	1992.
JAPAN			
Nippon Mining Co. Ltd.— Chita	Expan	3,500	Aromatics BTX June 1990.
Mizushima	Cat Reform	23,000	CCR. Dec. 1990.
	Hydrotreat	20,000	July 1990.
	Aromatics	4,300	BTX. Dec. 1990.
Showa Shell Oil K.K.— Kawasaki	Cat reform	19,100	Concat regen. JGC. May 1990.
Showa Yokkaichi Sekiyu Co. Ltd.— Yokkaichi	Isom	9,200	Isosiv. mid 1990.
Seibu Oil Co. Ltd.— Onoda	Isom	4,700	Bysomer. late 1989.
JORDAN			
Jordan Petroleum Refinery— Zerqa	Vacuum	7,300	1991.
	Visbreaking	7,500	1991.
	Hydrocrack	1,200	1991.
KOREA			
Yukong Ltd.—Ulsan	Vac	45,000	89,000 total cap.
	Reform	22,500	41,400 total cap. CCR.
	Hydrocrack	27,000	
	Hydroref	27,000	Resid desulf.
	Hydrotreat	22,500	61,400 total cap. Feed pretreat.
	Hydrotreat	9,000	19,500 total cap. SR dist.
	Aromatics	880	1,680 total cap. Cyclohexane.
	Hydrogen	50 MMcfd	Steam naph reform.
	LPG	3,800	Engr. stage. Engr: Parsons. 1991.
	LPG Sweet	10,000	Engr. stage. Engr: Parsons. 1991.
	Distiller	40,000	Product. Engr. stage. Engr: Parsons. 1991.
	Distiller	150,000	Crude. Engr. stage. Engr: Parsons. 1991.
	Reformer	30,000	Engr. stage. Engr: Parsons. 1991.
	Treater	5,000	Merox. Engr. stage. Engr: Parsons. 1991.
	Hydrotreater	30,000	Nahptha. Engr. stage. Engr: Parsons. 1991.
	Separator	25,000	Xylenes. Engr. stage. Engr: Parsons. 1991.
Kukdong Oil Co. Ltd's.— Daesan	Expan.	100,000	Dec. 1992.
	Vacuum	10,000	Sept. 1991.
	Cat Reform	10,000	Dec. 1992.
	Hydrotreat	22,000	Dec. 1992.
	Solvent	4,000	Sept. 1991.
	Lube	1,000	Sept. 1991
	Asphalt	3,665	Sept. 1991
KUWAIT			
Kuwait National Petroleum—Mina Al-Ahmadi	FCC	10,000	Revamp. Lic: UOP. End 1992.
	FCC	10,840	LPG merox. UOP process.
Technoexport (USSR)/Kuwait Oil Co. Ahmadi, Kuwait	Crude	240,000	Con: TPL. Nov. 1990.
LIBYA			
Sebha	New ref	20,000	Contr: Compagnie Tecnic Internazionale Progetti SpA. Planned.
MALAYSIA			
Esso Malaysia Berhad— Port Dickson	Cat reform	7,300	Under const. JGC. 1990.
Petroliam Nasional Bhd.— Tanjung Kling, Malacca	New ref.	100,000	Feasibility study revived.
Petronas Penapisan Sdn. Bhd.—Kerteh, Kemaman, Terengganu	Cat reform	5,850	Bimcat. Chiyoda. Feb. 1990.
MEXICO			
PEMEX— Mexico	FCC	40,000	Engr: Kellogg. Completion: 1990.
Petroleos Mexicanos:			
Cadereyta, Nuevo Leon	Visbreak	50,000	Eng. stage. 1992
Lazaro Cardenas, Mich.	New ref	200,000	Planned.
	Vacuum	120,000	
	Cat reform	40,000	
	Hydrotreat	40,000	Cat feed pretreat.
	Hydrotreat	16,000	Naphtha desulf.
	Hydrotreat	50,000	Distillates.
Salamanca, Gto.	Furfural	4,000	Under const.
Salina Cruz	Visbreak	50,000	Eng. Stage. 1991.
	FCC	40,000	Eng. stage. Tech: M.W. Kellogg. Staff. 1991.
	Cat reform	30,000	Cyclic bimcat. Naph. Eng. stage. Staff. 1990.
	Hydrotreat	36,000	Cat feed pretreat. Eng. stage. 1990.
	Hydroref	50,000	Mid dist. 2 units. Eng. stage. 1990.

REFINERIES

Company and location	Project	Capacity (b/d)	Remarks & completion
Tula	Hydrotreat	36,000	Cat feed pretreat. Eng. stage. 1990.
	Hydroref	50,000	Mid dist. 2 units. Eng. stage. 1990.
	Cat reform	30,000	Semi bimcat. Naph. Eng. stage. 1990.
NIGERIA			
Nigerian National Petroleum Corp.—Kaduna	Merox	6,000	$14.3 MM.
Port Harcourt	Hydrotreat	7,500	Naph desulf. Planned.
NORWAY			
A/S Norske Shell—Sola	Expan	4,000	isom. 1990.
	Expan	8,000	Kero Merox Unit. end 1990.
PAKISTAN			
Attock Refinery Ltd.—Rawalpindi	Crude	18,400	48,900 total cap. Howe-Baker. 1991.
	Vacuum	8,500	9,500 total cap. Howe-Baker. 1991.
	Visbreak	5,000	Howe-Baker. 1990.
PERU			
Petroleos del Peru—Iquitos	Vacuum	1,620	1990.
	Cat reform	1,620	1990.
La Pampilla	Vacuum	33,000	UOP. $280 MM. 1993.
	Visbreak	27,000	UOP. 1993.
	FCC	15,000	UOP. 1993.
	Merox	5,000	LPG. UOP. 1993.
	Merox	10,000	Gasoline. UOP. 1993.
Talara	Crude	13,000	75,000 total cap. 1991.
	Vacuum	4,200	28,200 total cap. 1991.
	FCC	6,400	23,000 total cap. 1991.
POLAND			
*Polimex Cekop			
*Mazowieckie Zaklady Rafineryjne i Petrochemiczne	Platformer	1,406	CCR tech. UOP process.
PUERTO RICO			
*Puerto Rico Sun Oil Co.—Yabucoa	Hydroref	17,000	Heavy gas oil. 1992.
	Solvent	22,000	Extraction. 1992.
QATAR			
National Oil Distribution.—Umm Said	Isom	5,500	Penex-Molex. Eng. stage. 1990.
SAUDI ARABIA			
Petromin-Mobil—Yanbu	Lubes	4,109	$160 MM. Plans revived.
Petromin-Shell—Al Jubail	Merox	11,600	UOP Equitec Services will build.
SINGAPORE			
Mobil Oil Singapore—Jurong	Hydrocrack	23,000	$80 MM both units.
	Isom-dewax	12,000	
Shell Eastern Petroleum—Pulau Bukom	Cat cracker	28,000	Chiyoda. Early 1990.
	Alky	4,200	Chiyoda. Early 1990.
SOMALIA			
Mogadishu	New ref	190,000	$500 MM. Late 1990.
SPAIN			
Century Oils Ltd.—Urduliz, Bilbao	Lube plant	301	$9 MM. Late 1990.
Cepsa—San Roque	Cat Reform	35,000	$65 MM. Lic: UOP. CCR platforming process. Late 1991.
Indian Additives Ltd.—Manali	Lube plant	301	joint venture with Madras Refineries Ltd. and Chevron Chemical Co.
Petroleos del Mediterraneo—Castellon de la Plana	Cat crack	10,000	25,000 total cap. $15 MM. Early 1990.
Petronor—Bilbao	Modernize	....	$90MM.
Repsol Petroleo—Puertollano	Coke	7,029	$86 MM. Mid 1990.
*Tarragona	Upgrade	....	$250 MM.
*Soc. Petrolifera Espanola Shell SA—Tarragona	Lube plant	....	$26 MM. Contractor: Dragados & Construcciones SA. Mid 1990.
Union Explosivos Rio Tinto SA.—Huelva	Cracker	12,000	Planning. Fluid Catalytic Cracker. 1991.
SWEDEN			
Skandinaviska Raff. Scanraff—Lysekil	FCC	....	Eng: Foster Wheeler. 1991.
	Isom	11,900	$C_5$and C_6 feed. Dec. 1990.
TANZANIA			
Tanzania Petroleum Development Corp.—Dar-Es-Salaam	New Ref	602	Bitumen. Snam. 1990.
	Vacuum	....	Snam. 1990.
THAILAND			
*Bangchak Petroleum—Bangkok	Modernize	40,000	Dist. unit. $80 MM. Bids out.
		14,000	Resid cracker.
		20,000	Revamp of idle resid cracker.
Esso Standard Thailand—Cholburi	Crude	37,000	100,000 total cap. $200 MM. Planned.
Thai Oil Co. Ltd.—Chonburi	Crude Dist.	100,000	Unlincensed. 1992.
	Hydrotreat	29,000	Naphtha. UOP 1992.
	Platformer	22,000	CCR. UOP 1992.
	Merox	18,000	Kerosine. UOP 1992.
	LPG Unit	....	Unlicensed 1992.
Sri Racha	Expan.	93,000	Distillation capacity. 1992.
	Vacuum	....	1992.
	Hydrocracker	32,300	Residuum. 1992.
	Cat Reform	23,800	CCR. 1992.
TURKEY			
Turkish Petroleum Refining—Aliaga-Izmir	Vacuum	42,000	1993.
	Visbreak	19,000	Lic: Lummus Crest BV. 1993.
	Hydrocrack	16,500	Dist. upgrade. Lic: UOP. 1993.
	Hydrogen	34.0 MMcfd	Steam naphtha reform. 1993.
Korfez-Izmit	Isom	5,000	Tech: UOP. 1990.
Kirikkale, Ankara	Hydrocrack	14,500	Lic: UOP. JGC. 1992.
	Hydrogen	21.0 -MMcfd	Lic: UOP. 1992.

REFINERIES

Company and location	Project	Capacity (b/d)	Remarks & completion
UNITED KINGDOM			
BP Oil.—Grangemouth, Scot.	Expan	20,000	Matthew Hall. Second quarter 1990.
Briggs Oil Limited—Dundee	Expan.	3,840	Crude. Jan. 1990.
		3,600	Vacuum. Jan. 1990.
Eastham Refinery Ltd.—Ellesmere Port	Crude	18,000	Expan.
	Vacuum	15,750	
	SR asphalt	12,000	
Gulf Oil Refining Ltd.—Milford Haven	Revamp	....	Hydrotreater. Feasibility: Matthew Hall.
*Phillips-Imperial Petroleum Ltd.—Port Clarence	Dewax	6,800	Heavy distillate catalytic dewaxer unit. $19.9 MM. Late 1990.
Texaco Ltd.—Pembroke	Hydrotreat	20,000	$43 MM. Early 1991.
	LPG	1,737	Recovery from Fuel gas. CEL. Jan. 1990.
	Upgrade	90,000	FCCU. Matthew Hall. Oct. 1990.
U.S.S.R.			
Omsk	fraction	51,107	Gaso feed. Technip.
	Hydrodesulf	21,925	Eng: Litwin.
Ufa	Gaso feed	51,107	Technip over all.
	HDA	21,925	Eng: Litwin.
VENEZUELA			
Corpoven—El Palito	Cat reform	2,500	Expan-revamp. BTX units. Lic: UOP: Con: Kellogg and Inelectra. $90 MM. 1990.
Puerto La Cruz	Hydrotreat	70,000	Lic: IFP-Total. Eng: Badger. Con: Inelectra. Eng. stage. $70 MM. 1991.
Lagoven—Amuay	Delay coke	16,000	$100 MM. Eng. stage. Foster Wheeler. 1990.
	Flexicoke	9,000	64,000 total cap. Eng. stage. Revamp. Lic: UOP. Ereco-Vepica. $24.1 MM. 1990.
VIET NAM			
Government	New ref	60,000	Engineers India Ltd. Feasibility study.
YUGOSLAVIA			
Rafin. Nafte Pancevo—Pancevo	Cat reform	17,800	Semi bimcat. UOP. 1995.
	Hydrotreat	25,500	34,300 total cap. UOP. 1995.
	Arom-BT	215	2,815 total cap. UOP. 1990.
ZAMBIA			
Indeni Petroleum Refinery Co. Ltd.—Bwanamkubwa	Vac	500	2,900 total cap. UOP. 1990.
	Hydrotreat	4,800	Dist. upgrade. UOP

Petrochemicals—WORLDWIDE CONSTRUCTION

*Designates projects listed for the first time in the Journal.

UNITED STATES

AIR PRODUCTS. Deer Park, Tex. Polyvinyl alcohol plant in the engineering stage. Engr. and Design: Bechtel. Completion: 1991.

AMOCO CHEMICAL. Gulf Coast. 1.5 billion lb/y ethylene plant. Feed: ethane, propane. Products: ethylene, methane, propylene, butadiene, fuel oil. $300 MM. Tech: MW Kellogg. Eng/des/lic: MW Kellogg. Completion: 1992. Planned.

Chocolate Bayou, Tex. Olefins unit in engineering study stage. Eng: MW Kellogg. Completion: 1992.

AMOCO PRODUCTS CO.

Alvin, Tex. Polyethylene debottleneck under construction. Contr: Fish. 1990.

AMOCO PERFORMANCE PRODUCTS INC. Greenville, S.C. 1.2 million lb/y polyacrylonitrile carbon fiber plant. Completion: early 1990.

***ARCO CHEMICAL. Gulf Coast.** Propylene oxide and styrene monomer plant. Engineering studies under way. Completion: late 1991 or early 1992.

Monaca, Pa. 120 MM lb/y thermoplastic elastomer plant in engineering stage. Eng: JV/EniChem. Contractor: John Brown. Completion: end 1990.

***Channelview, Tex.** Propylene oxide/styrene monomer II expansion in the engineering stage. $400 MM. Contractor: HB Zachry. Completion: 1992.

Los Angeles, Calif. 2,500 b/d MTBE unit under construction. Contractors: Fluor Daniel/Brown & Root. Completion: 1st Qtr. 1990.

ASHLAND PETROLEUM. Catlettsburg, Ky. 3,000 b/d MTBE unit. $11.5 MM. Summer 1990.

BORG-WARNER CHEMICALS. Geismar, La. (with Union Texas Petroleum and BASF)

Phase II: 30,000 lb/y ethylene expansion. Feed: ethane, propane. 1,500 lb/y propylene. Planned. Completion: early 1991.

***CAIN CHEMICAL CO. *Corpus Chirsti, Tex.** 34,000 mt/y ethylene expansion under construction. Feed: gas oil, naphtha, ethane, toluene, propane. Completion: Spring 1990.

***Lake Charles, La.** 68,000 mt/y ethylene expansion under construction. Feed: ethane, propane. Completion: late 1990.

Matagorda, Tex. 185,000 mt/y hd polyethylene expansion under construction. Feed: ethylene. Completion: Spring 1990.

***CHAMPLIN REFINING AND CHEMICALS INC. Corpus Christi, Tex.** 125 MM lb/y cumene expansion under construction. Feed: refinery products. Completion: Fall 1989.

Btx Revamp to increase capacity by 2,000 b/d to 7,000 b/d. Planning stage. Completion: 1991.

2,700 b/d Aromatics Disproportionation Unit. Planning stage. Completion: 1991.

***CHEMBOND CORP. Springfield, Ore.** 45,000 mt/y formaldehyde expansion under construction. Feed: methanol. Contractor: D.B. Western. Completion: early 1990.

CHEVRON CHEMICAL. Baytown, Tex. 200,000 mt/y lld polyethylene expansion. Feed: ethylene. Planned.

Cedar Bayou, Tex. 440 MM lb/y lld polyethylene unit (3.8 billion lb/y total cap.) under construction. Feed: ethylene. $220 MM. Contractor: Fluor Daniel. Completion: late 1990.

91,000 mt/y normal alphaolefins unit under construction. Feed: ethylene. $50 MM. Contractor: Becon. Eng: Bechtel. Completion: late 1990.

***Orange, Tex.** Gas phase polyethylene pilot plant. Completion: early 1990.

Port Arthur, Tex. 180 MM lb/y propylene expansion under construction. Feed: refinery propylene. Completion: late 1989.

St. James, La. 900 MM lb/y ethylbenzene-styrene expansion in construction stage. Contractors: Brown & Root, Badger Engineers. Mobil-Badger and Fina-Badger technology. $200 MM. Completion: late 1990.

CONCARB DIVISION, WITCO CHEMICAL. Ponca City. 34,000 mt/y carbon black unit. Feed: heavy aromatic oil. Planned. 1990.

CONOCO INC. Lake Charles, La. 1,900 b/d MTBE unit. Completion: early 1990.

Ponca City, Okla. Isomerzation expansion under construction. Contr: Zachry. Completion: Dec. 1989.

COSMAR INC. Carville, La. (joint venture with Fina Oil & Chemical, 200 MM lb/y, and Borg-Warner, 200 MM lb/y). 400 MM lb/y styrene expansion. Feed: benzene, ethylene. 1,500 gal/y toluene expansion in engineering stage. Eng: Badger. Tech: Mobil/Badger and Fina/Badger. Completion: 1990.

DIAMOND SHAMROCK R&M. Mont Belvieu, Tex. 600 MM lb/y propane-propylene unit.

Feed: propane-propylene mix. Eng: Davy McKee. Construction: HB Zachry. Completion: Apr. 1990.

Freeport, Tex. 230,000 mt/y aromatics plant in the engineering stage. Engr: Krupps Koppers. Completion: 1992

Gulf Coast. 1,000,000,000 lb/d styrene monomer plant. Completion: 1993.

EL PASO PRODUCTS. Bayport, Tex. 140,000 mt/y polypropylene unit planned. Feed: propylene. Completion: 1990.

EPSILON PRODUCTS. Wilmington, Del. 120,000 t/y polyproplene plant. Eng: Rust Intl. Completion: late 1990.

EXXON CHEMICAL CO. Baytown, Tex. 30% expansion debottleneck under construction. Contr: Zachry. Completion: Feb. 1990.

FINA OIL & CHEMICAL. Mont Belvieu, Tex. 90,719 mt/y propylene plant. Feed: LPG. Completion: mid 1990.

FORMOSA PLASTICS CORP. U.S.A. Point Comfort, Tex. 680,000 mt/y ethylene plant, derivative units, and related facilities. $3 billion.

200,000 mt/y ethylbenzene & styrene plant in the engineering stage. Engr: Badger. Tech: Mobil/Badger & Fina/Badger. Completion: 1990.7

***Pasadena, Tex.** 71,200 mt/y phenol expansion and 42,700 mt/y acetone expansion. Feed: cumeme. $36 MM. Planned.

HUNTSMAN CHEMICAL CORP. Belpre, Ohio. 32,000 t/y polystyrene expansion. Contractor: Lummus Crest.

LYONDELL PETROCHEMICAL. Channelview, Tex. 600 MM lb/y ethylene expansion. $25 MM. Contractor: Fluor. Completion: end 1989.

Aromatics and C4s expansion under construction. $58 MM

***MELAMINE CHEMICALS. Donaldsonville, La.** 30 MM lbs melamine plant. Feed: urea.

MOBIL CHEMICAL. Beaumont, Tex. Polyethylene expansion under construction. Total capacity: 1.7 billion lbs/y. $50 MM. Contractor: John Brown. Completion: early 1990.

***Joliet, Ill.** 120 MM lb/y high impact polystyrene production line which will boost capacity of resins to 485 MM lb/y. Completion: 1991.

***OCCIDENTAL CHEMICAL. Addis, La.** 23,000 mt/y polyvinyl chloride expansion under construction. Feed: vinyl chloride monomer. Completion: early 1990.

***Corpus Christi, Tex.** 500,000 mt/y vinyl chloride monomer plant under construction. Feed: chlorine, ethylene. Completion: late 1990.

1 billion lb/y olefins unit at either Corpus Christi, Chocolate Bayou, or Lake Charles. Preliminary engineering studies under way.

1,000 MM lb/y vinyl chloride unit under construction.$200 MM. Eng: Bechtel. Completion: 1991.

***Pasadena, Tex.** 32,000 mt/y polyvinyl chloride expansion under construction. Feed: vinyl chloride monomer. Completion: early 1990.

91,000 mt/y polyvinyl chloride expansion under construction. Feed: vinyl chloride monomer. Completion: Fall 1990.

***PETRO OIL & GAS INC. Sheridan, Wyo.** (joint venture with Perkins Power Inc.) 50 t/d polyurethane plant. $50 MM.

PHILLIPS 66. Houston, Tex. 275 MM lb/y hd polyethylene expansion (1.8 billion total cap.). Contractor: MW Kellogg. Completion: May 1990.

***Pasadena, Tex.** 275 MM lb/y polyethylene expansion. Feed: ethylene. Completion: July 1990.

*90 MM lb/yr K-resin expansion. Feed: butadiene, styrene. Contractor: H.B. Zachry. Completion: January 1990.

Old Ocean, Tex. 1.5 billion lb/y ethylene expansion at their Sweeny Plant (total cap. 4 billion). Design: Braun. Contractor: Brown & Root. Completion: Dec. 1990.

680,000 mt/y ethylene expansion planned. Feed: ethane, propane. Eng study: Braun. Contractor: Brown & Root. Completion: late 1990.

275 MM lb/y hd polyethylene expansion. Eng: MW Kellogg. Completion: Spring 1990.

POLYSAR POLYMERS. Leominster, Mass. 300 MM lb/y resin expansion. Completion: 1990.

Decatur, Ala. 200 MM lb/y polystyrene expansion. Completion: Fall 1990.

Orange, Tex. Expansion of their EPDM Rubber plant in the engineering stage. Engr: Bechtel. Completion: 1991.

QUANTUM—USI DIVISION. Clinton, Iowa. 45,000 mt/y additional ethylene expansion in 1991.

Deer Park, Tex. 200 MM lb/y vinyl acetate monomer expansion in engineering stage. Contractor: Fluor Daniel. Completion: Fall 1990.

680,000 mt/y ethylene plant in engineering stage. Feed: LPG. Contractor: MW Kellogg. Completion: early 1990.

91,000 mt/y hd polyethylene unit. Feed: ethylene. Completion: early 1990.

Morris, Ill. 23,000 mt/y lld polyethylene expansion under construction. Feed: ethylene. Completion: 1990.

66,000 mt/y polypropylene expansion under construction. Feed: propylene. Completion: 1991.

80,000 mt/y ethylene expansion. Feed: ethane, propane, butane. Eng: Lummus. Contractor: Braun. Completion: 1991.

ROHM & HAAS. Deer Park, Tex. Acrylic acid expansion under construction. $40 MM. Eng: Bechtel. Contractor: HB Zachry. Completion: May 1990.

Methacrylate consolidation expansion in the engineering stage. Engr: Bechtel. Completion: 1990.

***SOLTEX POLYMER CORP. Deer Park, Tex.** 300 MM lbs/y hd polyethylene expansion. Feed: C_2. Contractor: Fluor Daniel. Completion: mid 1990.

***SOUTH HAMPTON CO. Silsbee, Tex.** 1000 b/d solvent fractionation expansion in the engineering stage. Engr: Frantz

STANDARD OIL CHEMICAL. Green Lake, Tex. 23,000-95,000 mt/y maleic anhydride, 31,000 mt/y butanediol, 27,000 mt/y gamma-butyrolacetone, 11,000 mt/y tetrahydrofuran. Feed: n-butane. Planned. Completion: 1990.

SUN OIL CO. Philadelphia, Pa. $126 MM environmental work. Additions: alky unit, propane-propylene recovery unit and sulfer recovery unit, also upgrading the fluid catalytic cracker.

TENNESSEE EASTMAN. Kingsport, Tenn. Chemicals from coal expansion in the engineering stage. Engr: Bechtel. Completion: 1991.

TEXACO CHEMICAL CO. Conroe, Tex. 25 MM lb/y ethyleneamine expansion. Completion: mid 1990.

Port Neches, Tex. modernation of their butadiene unit which will increase capacity by 50 MM lb/y. Completion: Spring 1991.

Propylene Oxide, MTBE plant in the engineering stage. Engr: Bechtel. Completion: 1991.

***TEXAS EASTMAN CO. Longview, Tex.** *Oxoalcohol expansion under construction. Feed; propylene. Completion: 1990.

*110,000 t/y polypropylene plant planned. Feed: propylene. Completion: 1991.

*125,000 t/y polyethylene plant planned. Feed: ethylene. Completion: 1992.

*25,000 t/y amorphous polyolefins plant planned. Feed: propylene. Completion: 1991.

***UNION CARBIDE CHEMICALS & PLASTICS CO. INC. TAFT, La.** 410 mmlb/y expansion of their ethylene oxide plant. $200 MM.

UNION TEXAS PETROLEUM HOLDINGS INC. (partners: BASF AG and G.E. Plastics) **Geismar, La.** 310 MM lb/y ethylene expansion (total capacity: 1.1 billion lb/y). $71 MM. Completion: May 1990.

VISTA CHEMICAL. Lake Charles, La. 300 million lb/y (1 billion lb/y total cap.) ethylene expansion under construction. $80 MM. Contractors: Stone & Webster/HB Zachry. Completion: May 1990.

***Westlake, La.** 145,000 mt/y ethylene, 3,000 mt/y aromatics, 7,000 mt/y butadiene, and 4,000 mt/y propylene expansion planned. Feed: ethane. Completion: May 1990.

WESTLAKE POLYMERS. Lake Charles, La. 1 billion lb/y ethylene plant. Feed: NGL. Contractor: KCI. $250 MM. Completion: spring 1991.

WITCO CORP. Ponca City, Okla. Carbon Black expansion. $20 MM. Engr & Contractor: S.I.P. Completion: 1990.

ALGERIA

$170 billion petrochemical complex (joint venture with India). 450,000 t/y ethylene. Proposed.

ENTERPRISE NATIONALE DE LA PETROCHIMIE. Skikda. 50,000 mt/y linear alkylbenzene intermediates. UOP process. $80 MM.

ARGENTINA

IPAKO (51%) **and SHELL ARGENTINA** (49%). **Ensenada, BA.** 100,000 mt/y polypropylene unit planned. Shell Lipp/Shac tech. $110 MM. Completion: early 1990.

***PASA PETROQUIMICA ARGENTINA. Campana.** 40,000 mt/y urea expansion planned. Feed: natural gas. Completion: 1992.

***Neuquen.** 150,000 mt/y urea plant planned. Feed: natural gas. Completion: 1992.

***Puerto Gral. San Martin, Santa Fe.** 60,000 mt/yy benzene expansion planned. Feed: xylene, toluene, naphtha. Completion: 1991.

*120,000 mt/y styrene expansion planned. Feed: naphtha. Completion: 1991.

*40,000 mt/y ABS-SAN-PS plant planned. Feed: styrene, butadiene. Completion: 1990.

*120,000 mt/y propylene expansion planned. Feed: propane. Completion: 1994.

*100,000 ACN plant planned. Feed: propylene. Completion: 1994.

*1.5 mt/y biphenol 95 plant under construction. Feed: toluene. Completion: 1990.

PETROQUÍMICA GENERAL MOSCONI. Ensenada. Polyethylene terephthalate plant (12,000 mt/y fibre-grade; 5,000 mt/y bottle-grade) in the engineering stage. Contractor: Krupp Koppers. Completion: 1992.

POLITENO. Camaçari. 130,000 mt/y polyethylene expansion. Feed: ethylene. Lic: DuPont. Completion: 1991.

AUSTRALIA

***SHELL CHEMICAL (AUSTRALIA) PTY. LTD. Clyde, NSW.** 80,000 mt/y polypropylene plant to replace existing plant. Feed: refinery gas. Completion: mid 1991.

AUSTRIA

AGROLINZ. Linz. 500 mt/d ammonia synthesis plant in the engr. stage. Contractor: Uhde Gmbh. Completion: 1990.

BAHRAIN

BAHRAIN GOVERNMENT. 100,000 mt/y propylene and polypropylene complex. $200 MM. Feasibility study: Bechtel. Completion: 1991.

BELGIUM

ARCO CHEMICAL. Rieme. 65,000 mt/y polyols expansion in preliminary engineering stage. Contractor: Badger. Completion: Fall 1990.

***BASF. Antwerp.** 1,800 mt/d ammonia plant in the engr. stage. Completion: 1990.

Belgium. 945 mt/d nitric acid plant under construction. Completion: 1991.

***BAYER ANTWERPEN NV. Antwerp.** 23,000 t/y polycarbonate plant under construction. Feed: bisphenol A. Contractor: Fluor Daniel.

*24,000 t/y polycarbonate plant. Feed: bisphenol A. Contractor: Fluor Daniel. Planned.

DEN NORSKE STATS OLJESEKSKAP AS and HIMONT NORTH SEA PETROCHEMICAL INC. Antwerp. 180,000 mt/y polypropylene plant under construction. Contractor: Tecnimont. Tech: Himont. Feed: propane. Completion: Fall 1990.

400,000 t/y propylene plant. Feed: gas liquids. $404 MM. Tech: Air Products & Chemicals. Completion: 1991.

ETHYL SA. Feluy. 36,000 mt/y polyalphaolefin plant.

200,000 mt/y linear alpha olefins plant. $100 MM. Completion: 1991.

EXXON CHEMICAL BELGIUM. Meerhout. 120,000 mt/y polyethylene expansion under construction. Feed: ethylene. $30 MM. Completion: 1990.

450,000 mt/y ethylene unit in engineering stage. Feed: naphtha. Lic: MW Kellogg. Contractors: MW Kellogg, FW Italiana. Completion: 1991.

NESTY OY. Beringen. 120,000 mt/y polyethylene plant (total cap. will be 240,000 mt/y). $100 MM. Tech: Neste Chemicals. Contractor: John Brown BV. Completion: late 1990s.

NESTE CHEMICAL. unspecified. 20,000-25,000 mt/y polyalphaolefins plant. 1990.

Beringen. 120,000 TPA polyethylene plant. Contractor: John Brown. Completion: 1990.

NORTH SEA PETROCHEMICAL. Antwerp. 250,000 mt/y Propylene plant in the engineering stage. Design:Air Product. Completion: 1991.

BRAZIL

***CAPUAVA CARBONOS INDUSTRIAIS SA. Maua, SP.** 27,000 mt/y carbon black expansion planned. Feed: ethylene tar. $25 MM. Completion: 1992.

Triunfo, RS. 27,000 mt/y carbon black unit. Feed: ethylene tar. $30 MM. Planned. Completion: 1991.

CELBRAS QUIMICA E TEXTIL. Camaçari, Bahia. 27,000 mt/y polyester unit planned. Feed: dimethyl terephthalate, ethylene glycol. Completion: early 1990.

Pocos de Caldas, MG. 6,000 mt/y polyester expansion under construction. Feed: terephthalic acid, ethylene glycol. Completion: early 1990.

***COPENE. Camaçari.** 450,000 mt/y ethylene, 290,000 mt/y propylene, 86,000 mt/y butadiene, 420,000 mt/y pyrolysis gasoline, 200,000 mt/y aromatics (BTX) units under construction. Feed: gas oil, naphtha. $548 MM. Completion: 1991.

*86,000 mt/y butadiene plant under construction. Feed: crude, C4. Completion: 1991.

*60,000 mt/y MTBE plant under construction. Feed: raffinate 1. $10 MM. Completion: 1991.

25,000 mt/y butene 1 plant under construction. Feed: raffinate 2. $15 MM. Completion: 1991.

18,000 mt/y isoprene unit under construction. Feed: pentenes. Contractor: Ultratect. $35 MM. Completion: 1990.

13,500 mt/y octenes unit under construction. Feed: raffinate 3. $6 MM. Completion: 1990.

***COPENOR. Camaçari, Bahia.** 30,000 mt/y formaldehyde expansion. Feed: methanol. $7 MM. Completion: 1990.

***COPERBO. Cabo.** 35,000 mt/y polyisoprene plant in engineering stage. Feed: isoprene.

*8,000 thermoplastic elastomer plant planned. Feed: butadiene, styrene.

***NITRIFLEX SA. Camacari.** 5,500 mt/y MBS resins plant under construction. Feed: MMA, Butadiene, styrene. $32 MM. Completion: 1990.

***NITROCARBONO SA. Camacari.** 15,000 mt/y caprolactam and 30,000 mt/y ammonium sulfate expansion planned. Feed: cyclohexanone, ammonia, hydrogen.

*15,900 mt/y cyclohexanone and 4,200 mt/y sodium sulfate expansion planned. Feed: cyclohexane.

*15,900 mt/y cyclohexane expansion planned. Feed: benzene, hydrogen.

*12,000 mt/y plastics plant planned. Feed: caprolactam. $40 MM (US). Completion: August 1990.

OXIQUÍMICA. Triunfo. 25,000 mt/y acrylic acid, 30,000 mt/y esters planned. Feed: propylene. $55 MM. Contractor: Mitsubishi. Completion: 1991.

OXITENO. Triunfo. 25,000 mt/y acrylic acid, 30,000 mt/y acrylates. Feed: propylene. Planned. Completion: 1990.

PETROQUÍMICA UNIÃO. Capuava, Sao Paulo. 100,000 mt/y ethylene expansion. Contractor: Lummus Crest. Completion: Fall 1990.

Santo André. 440,000 mt/y ethylene, 245,000 mt/y propylene, 75,000 mt/y butadiene, 386,000 mt/y aromatics units (all total capacities) under way. Feed: naphtha. Completion: 1991.

POLIALDEN PETROQUIMICA. Camaçari. 100,000 mt/y polypropylene under evaluation. Feed: propylene.

POLIOLEFINAS SA. Camacari, Bahia. 130,000 mt/y linear polyethylene plant. Union Carbide process. Completion: 1991.

***POLITENO. Camacari.** 130,000 t/y low linear density polyethylene plant under construction. Contractors: Lummus/Setal. Completion: 1991.

***PRONOR PETROQUIMICA SA. Camacari.** 30,000 t/y toluene diisocyanate expansion under way. Feed: toluene, chlorine, natural gas, nitric acid. Completion: 1991.

*52,000 dimethyl terephthalate expansion planned. Feed: paraxylene, methanol. Completion: 1991.

*8,000 diphenyl methane diisocyanate expansion planned. Feed: benzene, chlorine, formaldehyde. Completion: 1992.

PROSINT PRODUTOS SINTÉTICOS SA. Rio de Janeiro. 79,200 mt/y methanol expansion planned. Feed: natural gas. $35 MM (U.S.) Completion: early 1993.

BULGARIA

***CHIMINVEST. Bourgas.** 50,000 mt/y linear low density polyethylene plant. $50 MM. Sclairtech process. Lic: DuPont Canada. Contractor: Lummus Crest. Engr: Combustion Engineering Inc.

Devnja. 150,000 mt/y vinylchloride monomer, 120,000 mt/y ethylene dichloride units in engineering stage. Contractor: TEC. Completion: 1990-91.

NEFTOCHIM. Burgas. 150,000 mt/y ethylene plant under construction. Lic: MW Kellogg. Eng: MW Kellogg, Kawasaki. Completion: 1990.

CANADA

ALBERTA GAS ETHYLENE CO. LTD. Joffre, Alberta. 680,000 mt/y ethylene, 20,000 mt/y propylene, 28,000 mt/y butadiene, 27,000 mt/y aromatics plant planned. $350 MM. Feed: ethane. Completion: 1992.

ALBERTA NATURAL GAS. Scotford. 2,000 t/d methanol, 11,600 b/d MTBE. Feed: natural gas, butane. Before ERCB. $600 MM.

BF GOODRICH CANADA INC. Niagara Falls, Ont. Polyvinyl chloride resins expansion planned. Feed: vinyl chloride. $60 MM. Completion: early 1990.

***BORDEN CANADA. Edmonton, Alta.** 35,000 mt/y formaldehyde expansion under way. Feed: methanol.

***Laval, Que.** 35,000 mt/y formaldehyde expansion under way. Feed: methanol.

***Laval, Que.** 25,000 mt/y formaldehyde expansion under way. Feed: methanol.

***Vancouver, B.C.** 25,000 mt/y formaldehyde expansion under way. Feed: methanol.

***West Hill, Ont.** 12,000 mt/y formaldehyde expansion under way. Feed: methanol.

***CARGILL LTD. Bell Plaine, Sask.** 1,500 mt/d anhydrous ammonia, 2000 mt/y urea units. $350 MM. Completion: Spring 1992.

NESTE OY. Edmonton, Alta. 500,000 mt/y methyl tertiary butyl ether plant. $210 million. Contractor: FluorDaniel Inc.

NOVA (with partners). **Red Deer, Alta.** Petrochemical complex planned.

NOVACOR CHEMICALS LTD. Joffre, Alta. 275,000 mt/y polyethylene plant. $200 million. Completion: fall 1992.

Ethylene plant plant in the engineering stage. Braun tech. Completion: 1992.

***PETRO-CANADA. Edmonton, Alta.** MTBE Plant 453,500 mt/y. Joint venture with Neste Oy. Completion: 1991.

PETROMONT INC. Varennes/Montreal East. 200,000 mt/y HD Polyethylene plant. Modernization.

***SHELL CANADA. Corunna, Ont.** 40,000 mt/y polypropylene expansion under construction. Feed: propylene. Completion: 1990.

*40,000 mt/y styrene expansion planned. Feed: benzene, ethylene. Completion: 1991.

***UNION CARBIDE. Prentiss.** 360,000 mt/y ethylene glycol plant planned. Feed: ethylene. Completion: late 1992.

WESTCOAST ENERGY INC. Taylor, B.C. Ethane-based petrochemical plant under consideration. Seeking bids.

CHILE

MINCO. 560,000 mt/y ammonia-urea plant. $350 MM. Planned.

PETROCHEMICAL

CHINA

Anda. 20,000 mt/y monomethyl-metacrylate unit under construction. Contractor: Tecnimont. Completion: 1990.

50,000 mt/y ethylene oxide and ethylene glycol units. Royal Dutch Shell process. $53.5 MM. Contractor: Technip. Completion: 1991.

72,000 mt/y linear alkylbenzene, 54,000 mt/y linear olefins units. UOP tech.

120,000 mt/y ethylene unit. Lummus Crest tech.

80,000 mt/y lld polyethylene unit. Sclairtech process. Lic-eng-supply contractor: Lummus Canada.

Jinxi, Liaoning Province. 1,000 mt/d ammonia plant in engineering stage. Tech: Braun. Contractor: Technip. Completion: 1991.

Erlian, Inner Mongolia. 300,000 mt/y ammonia, 520,000 mt/y urea. Planned.

150 t/d ammonia expansion under way. $10 MM. Contractor: Humphreys & Glasgow.

Panjing, Liaoning Province. 130,000 mt/y ethylene plant. Feed: ethane, propane, butane from Liao He field. Design-eng-tech: Lummus Crest. Contractors: TEC, C. Itoh, and TPL. Completion: Sept. 1991.

125,000 mt/y lld polyethylene, 40,000 mt/y polypropylene, 10,000 mt/y butene 1 units. Lic: BP on polyethylene, Mitsui PC on polyprop, IFP on butene. Contractor: Technipetrol. Completion: Sept. 1992.

Shantou Special Economic Zone. 250,000 mt/y of ethylene, 480,000 mt/y of synthetic resin, 150,000 mt/y of solid caustic soda, and 180,000 mt/y of other chemicals. $800 MM complex proposed by Thai Co. Ltd.

Shengli. 80,000 mt/y SBR unit under construction. Contractor: Mitsubishi Heavy.

***Xinjiang Uygur Autonomous Region.** $600 MM petrochemical complex that includes a 140,000 mt/y ethylene plant.

***CHIA TAI CO. LTD. Shantou Special Economic Zone, Guangdong Province.** $800 MM petrochemical complex (250,000 mt/y ethylene, 480,000 t/y synthetic resin, and 180,000 t/y organic chemicals and other products).

CHINA INTERNATIONAL PETROCHEMICAL CO. Shanghai petrochemical complex. 80,000 mt/y polyethylene plant. Tech: Mitsubishi. Contractor: Snamprogetti.

Jinshanwei. 80,000 t/y LD Polyethylene plkant under construction. Design: Snamprogetti. Completion: 1990.

CHINA NATIONAL CHEMICAL CONSTRUCTION CORP. 4 urea plants, 400 t/d each, under construction. Contractor: Snamprogetti. Completion: 1991. (Hebei, Henan, Shanxi and Beijing Provinces)

***Taizhou, Jiaugsu.** Secondary Butanol-Alchol and Methyl Ethyl Ketone plant in the engineering stage. Process design: Edeleanu Gmbh. Completion: 1991.

CHINA NATIONAL TECHNICAL IMPORT CORP. Fuling, Sichuan Province. 1,000 mt/d ammonia plant in engineering stage. Tech: Braun. Contractor: Technip. Completion: 1990.

1,750 t/y Urea plant in the engineering stage. Design: Snamprogetti. Completion: 1993.

Hejiang, Sichuan Province. 1,000 mt/d ammonia plant in engineering stage. Tech: Braun. Contractor: Tecnimont. Completion: 1991.

1,765 t/d urea plant under construction. Contractor: Snamprogetti. Completion: 1991.

Jinan. 75,000 t/y pure terephthalic acid plant in engineering stage. Contractor: MES. Completion: 1991.

Sichuan. 600 mt/d ammonia plant in engineering stage. Eng-lic: MW Kellogg. Contractor: Sichuan Chem Works. $50 MM. Completion: late 1990.

15,000 t/y alcohols plant in engineering stage. Eng/des: Uhde. Lic: Henkel. Completion: 1991.

Panjin. 125,000 t/y polyethylene, 40,000 t/y polypropylene, 10,000 t/y butene-1. Contractor: Technipetro; S.p.A. Completion: Sept. 1991.

40,000 t/y polypropylene plant under construction. Conr: Tecnimont. Completion: 1992.

CHINA NORTH INDUSTRIES CORP. Lanzhou. 44 MM lb/y toluene diisocyanate plant. Contractor: BASF AS.

JILIN CHEMICAL IND. Jilin. 27,200 mt/y acrylic acid unit in engineering stage. Contractor: JGC. Completion: 1992.

30,000 mt/y acrylic ester unit in engineering stage. Contractor: JGC. Completion: 1992.

LANZHOU CHEMICAL INDUSTRY CO. Lanzhou, Banxu Province. 60,000 mt/y lld polyethylene plant in engineering stage. Lic: BP. Eng: SinoKellogg. Contractor: Sinopec. Completion: 1990.

NANJING ORIENTAL CHEMICALS IND. CORP. Nanjing. 50,000 mt/y caprolactam plant in engineering stage. Contractors: Didier/Voest Alpine. Process: Stamicarbon. Completion: 1992.

PANZHIHUA IRON AND STEEL WORKS. Dukou. 7,000 mt/y ammonia, 8,000 mt/y sulfuric acid units under construction. Contractor: Krupp Koppers. Completion: 1990.

SHANGHAI PETROCHEMICAL COMPLEX. Shanghai. 70,000 mt/y polypropylene unit under construction. Eng/des/con: Tecnimont. Completion: 1991.

SINOPEC. Weifang. 6,000 polyolefins plant. Eng/des: Uhde. Lic: Hoechst. Completion: 1990.

Lanzhou. 60,000 mt/y LLDPE. Engineering stage. Contractor: Sinopec. Completion: 1990.

XIANGTAN FINE CHEMICAL CO. Hunan Province. 1,500 mt/y skid-mounted ethylene amine plant. Prebuild and ship by MACC, Calgary and Fort Saskatchewan Eng. Serv., Canada. $3 MM.

***YIZHENG CORP. Yizheng.** (Joint venture with Amoco Chemical). Polypropylene and purified terephthalic acid plants planned.

***ZHENIANG CHEMICAL FACTORY. Zheijiang Province.** (joint venture with Dow Chemical). 20,000 mt/y propylene oxide, 20,000 mt/y polyether polyol, 5,000 mt/y propylene glycol. $50 MM. Contractor: Dow Chemical. Completin: 1993.

ZHONG YUAN PETROCHEMICAL UNITED CORP. Puyang, Henan Province. 140,000 mt/y polyethylene plant in engineering stage. Tech: DuPont Canada. Contractor: CTIP, CNTIC. $180 MM. Completion: 1992.

140,000 mt/y ethylene plant in engineering stage. Tech: Lummus Crest. Contractor: CTIP, CNTIC. Completion: 1992.

CHINA, HONG KONG

CABOT PLASTICS. Hong Kong. Polymer compounding plant under construction. £5 MM. Contractor: Simon-Carves Ltd. Completion: 1990.

CHINA, TAIWAN

***CHANG CHUN PETROCHEMICAL CO. Miaoli.** 20,000 mt/y bisphenol A plant under construction. Feed: phenol, acetone. Contractor: Staff. Completion: early 1990.

CHINA AMERICAN PETROCHEMICAL CO LTD. Lin Yuan. 250,000 mt/y terephthalic acid expansion under construction. Feed: paraxylene. Eng/des: CTCI. Contractor: Chiyoda. Completion: August 1990.

CHINESE PETROLEUM CORP. Kaohsiung. 400,000 mt/y ethylene, 230,000 mt/y propylene, 67,500 mt/y butadiene, 14,000 bpsd aromatics units under construction. Feed: Naphtha, gas oil. Contractors: Kellogg/CTCI. Completion: mid 1990.

12,000 b/d aromatics extraction unit to produce BTX. Engineering stage. Arco process. Lic-design: HRI Inc. Completion: 1990.

CHINA PETROCHEMICAL DEVELOPMENT CORP. Kaohsiung. 2,000 mt/y naphthalene unit under construction. Feed: fuel oil.

Ta-Sheh. 66,000 mt/y acrylonitrile expansion planned. Feed: propylene. 80,000 mt/y acetic acid expansion planned. Feed: carbon monoxide.

Toufen. 65,000 mt/y caprolactam expansion planned. Feed: cyclohexane.

CHINA PETRO-CHEMICAL INTERNATIONAL CO. 15,000 t/y Polystyrene (SAN) plant. Contractor: Toyo Engineering Corp.

CHIUNGLONG PETROCHEMICAL CO. LTD. Kaohsiung. 22,000 mt/y polypropylene glycol unit under construction.

CIBA GEIGY TAIWAN LTD. Kaohsiung. 6,000 mt/y Phonolic anti-oxidant plant. Eng. and design: CTCI. Completion: 1991

***FORMOSA PLASTICS CORPORATION. Taipei.** 24,000 mt/y epichlorohydrin plant in the engineering stage. Contr: Comprimo. Completion: 1990.

***GRAND PACIFIC PETROCHEMICAL CORP. Kaohsiung.** 120,000 t/y styrene monomer plant. Feed: ethylene, benzene. Planned. Completion: 1991.

HOUNG CHOU CHEMICAL INDUSTRIES. Tao Yuan Shien. 52,500 polyester polycondensation plant in engineering stage. Contractor: Zimmer. Completion: 1990.

HUALON CORP. TOU FEN. 75,000 t/y polyester polycondensation plant in engineering stage. Contractor: Zimmer. Completion: 1990.

HO TUNG CHEMICAL CORP. Jen-Wu, Kaohsiung. 40,000 mt/y n-paraffins plant under construction. Feed: kerosine. Completion: 1991.

ICI. New PTA plant and offsites. Contractor: John Brown. Completion: 1992

IMPERIAL CHEMICAL INDUSTRIES PLC. Taiwan. 350,000 mt/y terephtalic acid plant. $250 MM. Contractor: John Brown. Completion: early 1990's.

KAOHSIUNG MONOMER CO. LTD. Kaohsiung. 120 t/d maleic anhydride plant in engineering stage. Contractor: CTCI. Completion: 1990.

***LEE CHANG YUNG CHEMICAL INDUSTRY CORP. Kaohsiung.** Pentaarythritol plant. Completion: 1990.

*Formic acid plant. Completion: 1990.

***Linyuan.** MEK plant. Completion: 1990.

NAN YA PLASTICS CORP. 250,000 mt/y phthalic anhydride unit in engineering stage. Von Heyden low energy process. Contractor: Davy McKee. Completion: 1990.

Naju. 150,000 mt/y 2-Ethyl Hexanol, 20,000 Butanols in the engineering stage. Engr: Davy McKee. $100MM.

***ORIENTAL UNION CHEMICAL CORP. Kaoshiung.** Ethylene glycol plant. Feed: ethylene. Planned.

***TAIWAN FERTILIZER CO. Miaoli.** 10,000 mt/y melamine plant under construction. Feed: urea. Completion: June 1991.

TAIWAN STYRENE MONOMER CORP. Kaohsiung. 100,000 mt/y ethylbenzene/styrene monomer unit under construction. Contractors: Badger/JGC/CTCI. Tech: Mobil/Badger & Fina-Badger. Completion: 1990.

TAIWAN SYNTHETICS. Taipei. 15,000 mt/y maleic anhydride unit. Lic: Lummus. Completion: 1990.

TUNTEX PETROCHEMICAL INC. 285,000 mt/y terephthalic acid plant under construction. Contractor: Tecnimont. Completion: 1990.

UNION PETROCHEMICAL CORP. Taiwan. 32,300 t/y phthalic anhydride plant and 3,000 fumaric acid plant in engineering stage. Contractor: Davy McKee.

YUNG CHIU CHEMICAL. Lin-Yuan. 110,000 mt/y polypropylene plant. Eng. and Design: CTCI. Completion: 1990

COLOMBIA

AMONIACO DEL CARIBE. Cartagena. 50 t/d ammonia expansion under construction. Feed: natural gas.

CARBOQUIMICA. Bogota. 20,000 mt/y plasticizers expansion. Planned. Feed: phthalic anhydride, oxoalcohols. Staff will build.

DOW QUIMICA DE COLOMBIA. Cartagena. 40,000 mt/y polystyrene plant. Feed: styrene. $16MM. Completion: late 1991.

CZECHOSLOVAKIA

DUSLO. Sala. 4.0 MMscfd Hydrogen PSA unit in the engineering stage. Engr: Linde. Completion: 1990.

TECHNOEXPORT-PRAHA. Lovosice. 1,200 t/d calcium, ammonia, nitrate plant in the engineering phase. $43 MM. Completion: 1991.

EGYPT

ABU QIR FERTILIZERS & CHEMICAL INDUSTRIES. Abu Qir. 330,000 t/y ammonia plant under construction. Contractor: Uhde. Lic: Uhde. Completion: 1991.

EGYPTIAN PETROLEUM CO. Anerya. 30,000 t/y PVC compound plant in the engineering stage. Completion: Dec. 1990.

FRANCE

ARCO CHEMICAL. Fos-sur-Mer. 40,000 mt/y polyols plant in preliminary engineering stage. Contractor: FW Francaise. Completion: Fall 1990.

***APPRYL. Lavera.** 150,000 mt/y polypropylene unit. Proposed.

***ATOCHEM. Gonfreville.** 110,000 mt/y polyethylene unit. Proposed.

80,000 t/yr ethylene plant revamp, debottlenecking. Contr: Technip. 1990.

BP CHEMICAL. Wingles. 18,000 t/y revamp of their expandable polystyrene plant. Contr: Technip. 1990.

***EXXON CHEMICAL LTD. Le Havre.** 140,000 t/y polypropylene plant. Proposed.

***EXXON CHEMICAL LTD. AND SHELL CHIMIE. Notre Dame de Gravenchon.** 220,000 mt/y linear low density polyethylene plant. $158 MM. Design-engineering under way. Joint construction under consideration.

***NAPTHA CHIMIE. Lavera.** 15,000 mt/y ethylene plant revamp, debottlenecking cracker 4. 1992.

***PROPYLENE ATLANTIQUE. Donges.** Propylene recovery unit from FCC unit (Propylene Distillate 18 t/yr, Propylene Purification 18 t/y). Contr: Technip. 1990.

SHELL CHIMIE. Berre L'Etang. Thermo-plastic rubber plant. Contr: Technip. 1991.

SOCIÉTÉ FRANÇAISE HOECHST. Lillebonne. 120,000 mt/y polypropylene unit under construction. Himont technology. Completion: 1990.

***STE. du CAOUTCHOUC BUTYL. Notre Dame de Gravenchon.** 15,000 mt/y ethylene propylene rubber expansion. Completion: end 1990.

GERMANY, EAST

Schkopau. 25,000 mt/y hd polyethylene plant under construction. Unipol process. Feed: ethylene. Contractor: Linde AG.

INDUSTRIE ANLAGEN. Leuna. Hydrogen Sulfer plant under construction. Completion: 1989. $16.5 MM.

Ammonia plant expandsion under construction. Completion: 1990.

GERMANY, WEST

BASF. Ludwigshafen. 140,000 mt/y acrylic acid expansion in engineering stage. Contractor: Lurgi.

COLUMBIAN CARBON. Hamburg. Carbon black expansion planned. Feed: oil.

DEUTSCHE MARATHON PETROLEUM. Burghausen. 80,000 t/y hd polyethylene plant in engineering stage. Contractor: Lurgi.

60,000 t/y expansion of ethlene plant. Engr. stage. Completion: 1990.

DEUTSCHE TEXACO. Moers. 10,000 mt/y maleic anhydride unit conversion (C_4) in engineering stage. Design: Scientific Design. Completion: 1990.

***EC ERDOLCHEMIE. Cologne.** 420,000 mt/y lld polyethylene plant. Feed: ethylene. Contractor: Uhde. Completion: 1991.

Worrigen. 120,000 t/y LLDPE in the engr. stage. Contractor: Uhde GmbH. Completion: 1990.

Bavaria. 50,000 mt/y propylene plant. Completion: spring 1990.

HÜLS AG. 125,000 mt/y styrene unit. Lic: Monsanto/LCI. Eng: Lummus. Completion: 1990.

New hydrogen plant in the engr. stage. Completion: 1990.

Gelsenkirchen-Scholven. 75,000 mt/y polypropylene plant planned. Unipol process. Completion: early 1991.

***Lulsdorf.** 60,000-70,000 mt/y dimethyl terephthalate revamp. Completion: 1992.

*100,000 mt/y pure terephthalate acid plant. Completion: 1992.

***Marl.** 50,000 mt/y styrene expansion under construction. Completion: mid 1990.

*75,000 mt/y polypropylene expansion under construction. Feed: propylene. Completion: early 1991.

60,000 mt/y acrylic acid, 40,000 mt/y acrylates units under construction. Feed: propylene. Design: JGC-Mitsubishi PC. Completion: mid 1990.

Acetylene plant in the engineering stage. Contr: Linde. Completion: 1991.

OBERRHEINISCHE MINERALOLWESHE. Karlsruhe. MTBE plant in the engineering stage. Contractor: Edeleanu. Completion: 1990.

POB Polyolefine Burghausen GmbH (ÖMV). Burghausen. 80,000 mt/y hd polyethylene unit in engineering stage. Licensor: Mitsui. Contractor: Lurgi. Completion: 1990.

RUHR OEL. Gelsenkirchen. 70,000 mt/y cumene expansion planned. Feed: benzene, propylene. 40,000 mt/y ethylene, 25,000 mt/y propylene expansion planned. Feed: naphtha. Contractor: Linde.

RUHR STICKSTOFF. Brunsbuttel. 100,000 t/y urea expansion. Contractor: Snamprogetti. Planned. 1990.

***UNION RHEINISCHE BRAUNKOHLEN KRAFTSTOFF. Wesseling.** Planned expansion of the following: 40,000 mt/y ethylene, 23,000 mt/y propylene, 12,000 mt/y C_4-cut, 26,000 mt/y pyrolsis gasoline, 4,000 mt/y fuel oils. Feed: naphtha. Contractor: Lummus Crest/Santa Fe Braun. Completion: 1990-91.

WINTERSHALL AG. Lingen. Revamp of their reformer adding 5,000 b/d to their total capacity of 21,100 b/d. $8MM. Completion: 1990.

HUNGARY

BORSODI VEGYI KOMBINÁT. Kazincbarcika. 25,000 mt/y MDI, diphenylmethane di-isocyanate. Feed: aniline. Contractors: Chisso, Mitsui Toatsu. Completion: 1990.

CHEMOKOMPLEX. Acrylic fiber plant in engineering stage. £13 MM. Contractor: Simon-Carves. Completion: 1990.

***DUNAMONT CO. LTD. Szazhalombatta.** 65,000 polystyrene plant under construction. Feed: styrene. Contractors: Tecnimont and Danube Refinery. Completion: 1991.

*20,000 polystyrene plant under construction. Feed: styrene. Contractors: Tecnimont and Danube Refinery. Completion: 1991.

TISZAI VEGYT KOMBINAT. Leninváros. 50,000 mt/y expansion of their ethylene plant. Contractor: Kinetics Tech. Inter. Completion: 1990.

INDIA

ANDHRA PETROCHEMICAL LTD. Visakhapatnam, Andhra Pradesh. 30,000 mt/y oxy-alchohols unit in engineering stage. $100 MM. Con: Davy Powergas. Completion: 1990.

30,000 mt/y 2-Ethyl Hexanol Butanols (LP oxo process) in the engineering stage. Contractor: Davy McKee. Completion: 1991.

ADARSH. Udhna, Surat. 7,200 mt/y maleic anhydride unit under construction. Feed: benzene. Contractors: Staff/ Scientific Design. Completion: 1990.

ASSAM INDUSTRIAL DEVELOPMENT CORP. Maron-Lakwa. Planned facility for 7,500 t/y methanol, 12,000 t/y formaldehyde, 6,000 t/y PVC. Engineering on methanol: Humphreys & Glasgow.

CETEX PETROCHEMICAL. Madras. secondary Butanol-alchol and Methyl Ethyl Ketone plant under construction. Process Design: Edeleanu. Completion: 1990.

CTI INVESTMENTS LTD. Manali, Madras. 4,200 t/y MEK unit in engineering stage. $15 MM. Design/Lic: Edeleanu. Contractor: Davy Powergas India. Completion: 1990.

DEEPAK FERTILIZERS & CHEMICALS CORP. LTD. Taloja, Maharashtra. 300 t/d methanol plant in engineering stage. $70 MM. Contractor: Davy Powergas India. Completion: 1991.

***FERTILIZERS AND CHEMICALS TRAVACORE LTD. Udyogamandal.** *297,000 mt/y ammonia expansion (replacement of old plants with expansion in capacity.) Feed: naphtha. Contractor: Fact Engineering. Pending government approval.

GNFC. India. 620 t/d nitric acid, 100 t/d high conc. nitric acid, 475 t/d nitric phosphate, 475 t/d calc. amm. nitrate. New plant under construction. Contractor: Uhde GmbH. Completion: 1990/91.

GODREJ SOAPS LTD. Bharuch, Gujarat. 30,000 t/y Alpha Olefins plant in the engineering stage. $66 MM. Contr: Davy Powergas. Completion: 1991.

GUJARAT CARBON. Baroda. secondary Butanol-Alchol and Methyl Ethyl Ketone plant under construction. Process Design: Edeleanu. Completion: 1990.

GUJARAT NARMADA VALLEY FERTILIZERS CO. LTD. Narmadanagar, Bharach. 100,000 mt/y methanol unit under construction. Feed: natural gas. $70 MM. Contractors: ICI, Toyo. Completion: June 1991.

50,000 mt/y acetic acid unit under construction. Feed: methanol, carbon monoxide. $40 MM. Contractors: BP, MES. Completion: Dec. 1991.

GUJARAT STATE FERTILIZERS CO. LTD. Fertilizernagar. 50,000 mt/y caprolactam unit under construction. Feed: benzene. $307 MM. BASF tech. Contractor: Uhde. Completion: July 1991.

1,350 mt/d ammonia expansion planned. Feed: naphtha, natural gas. $230 MM. Completion: early 1991.

10,000 mt/y melamine expansion planned. Feed: urea. $31 MM.

HALDIA PETROCHEMICALS. Calcutta. 10,000 mt/y ethylene oxide, 60,000 mt/y ethylene glycol units in engineering stage. Design: Scientific Design. Completion: 1990.

HERDILLIA CHEMICALS LTD. Thane. 3,500 mt/y alkyl phenols unit under way. Feed: phenol olefins. Contractor: Power Gas India.

10,000 mt/y EDPM rubber. Feed: ethylene, propylene. Planned.

2,000 mt/y diphenyl oxide, 1,500 mt/y isopropyl phenols, 1,000 mt/y plasticizers units. Planned. Feed: phenol, propylene, phosphorous, oxychloride.

INDIAN ADDITIVES LTD. Madras. 15,000 t/y lube oil additives plant. Completion: end 1991. (joint venture of Chevron Chemical Co. and Madras Refineries Ltd.)

INDIAN OIL CORPORATION. Baroda. Steam reformer shift PSA in the engineering stage. Contr: Linde. Completion: 1991.

INDIAN PETROCHEMICALS CORP. LTD. Nagothane.

PROJECTS TO BE COMPLETED IN MARCH 1990:

300,000 mt/y ethylene, 30,000 mt/y propylene units, 36,000 mt/y FCC propylene recovery unit. Feed: natural gas. Lic: Stone & Webster. Contractor: EIL.

80,000 mt/y ld polyethylene unit. Feed: gas. Lic: CdF Chimie. Contractor: EIL.

160,000 mt/y lld polyethylene unit. BP process.Design-const: Technip, Dodsal-India. $59.2 MM.

50,000 mt/y ethylene glycol, 5,000 mt/y ethylene oxide, 3,600 mt/y diethylene glycol, 160 mt/y triethylene glycol units. Feed: gas. Lic: Union Carbide. Contractor: EIL.

60,000 mt/y polypropylene expansion under construction. Feed: gas. Lic: Tecnimont, Himont. Contractor: EIL.

1,740 mt/y acetylene black unit under finalization. Feed: gas. Contractor: EIL.

McDOWELL & CO. LTD. (Polymers Division). Visakhapatnam.

*5,000 mt/y ABS plant under construction. Feed: acrylonitrile, butadiene, styrene. Completion: 1991.

66,000 mt/y styrene expansion planned. Feed: ethylene, benzene. Completion: 1992.

20,000 mt/y polystyrene expansion planned. Feed: styrene. Completion: 1992.

MURABLACK INDIA LTD. Tarapur. 9,000 t/y Carbon Black plant in the engineering stage. $20 MM. Contr: Davy Powergas. Completion: 1990.

NAGARJUNA FERTILIZERS & CHEMICALS LTD. Kakinada, Andhra Pradesh. 1,500 mt/y urea, 900 t/d ammonia units under construction. Feed: naphtha. Contractors: Snamprogetti, PDIL. Completion: May 1991.

NATIONAL PETROCHEMICAL CORP. Koyali, Gujarat. 100,000 mt/y ethylene, 60,000 mt/y propylene, 9,000 mt/y butadiene, and 12,000 mt/y mixed butadienes.

POLYPROPYLENE INDIA LTD. Mathura District. 30,000 t/y polypropylene. Lic: Solvay tech. Completion: mid 1990. (29% Kanoria Group, 11% each Solvay, Pradeshiya Industrial Investment Corp., 49% public).

RASHTRIYA ISPAT NIGAM. Visakhapatnam. 22,000 mt/y BTX, 33,000 mt/y crude benzole hydrogenation units in engineering stage. Contractor: Krupp Koppers. Completion: 1990.

33,000 mt/y aromatics plant in the engineering stage. Contactor: Krupp Koppers. Completion: 1991.

RAYMOND SYNTHETICS LTD. Allahabad. 15,000 t/y Polyester Filament Yarn plant in the engineering stage. $120 MM. Contr: Davy Powergas. Completion: 1991.

RELIANCE INDUSTRIES LTD. Hazira. Ethylene oxide-ethylene glycol units in engineering stage. Design: Scientific Design. Completion: 1990.

SYNTHETICS & CHEMICALS LTD. Bareilly. *48,750 mt/y styrene expansion planned. Feed: alcohol, benzene.

47,000 mt/y SBR plant planned. Feed: styrene, butadiene.

TATA FERTILIZER LTD. Babrala, Uttar Pradesh. 1,350 t/d ammonia plant under construction. Contractor: Snamprogetti. Completion: 1992.

2 urea units, 1,125 t/d each under construction: Contractor: Snamprogetti. Completion: 1992.

***THIRUMALAI CHEMICALS LTD. Ranipet (Tamil Nadu).** 4,000 mt/y polyester resins plant under construction. $1.5 MM. Contractor: staff.

10,000 mt/y maleic anhydride plant in the engineering stage. Feed: benzene, butane. $22 MM. Contractor: Alusuisse Italia/Davy Powergas. Completion: 1991.

INDONESIA

Bunyu, East Kalimantan. 300,000 t/y MTBE plant. Completion: 1993.

60,000 acetic acid plant. Completion: 1993.

Dumai, Sumatra. 75,000 t/y normal paraffins plant. Completion; 1992.

Musi, South Sumatra. 10,000 t/y MEK plant. Completion: 1992.

BP CHEMICALS. West Java. (joint venture with Indonesian government) 400,000 mt/y polyethylene plant. $200 MM. Completion: 1991.

OLEFIN CENTER SHELL GROUP. Cilacap, Central Java. 50,000 mt/y ethylene, 50,000 mt/y propylene, 225,000 mt/y polyethylene, 125,000 mt/y polypropylene, 100,000 mt/y ethylene glycol, 120,000 mt/y LPG, 45,000 mt/y fuel gas, 240,000 mt/y fuel oil, 170,000 mt/y C_5-Py gas, and 120,000 mt/y C_9-Py gas units. Completion: 1993.

***PERTAMINA. Arun, Aceh, North Sumatra.** 321,000 mt/y benzene, 19,600 mt/y toluene, 217,000 mt/y xylene mix, 39,700 mt/y orthoxylene, 180,000 mt/y CHX units planned. Feed: condensate. Contractors: Kellogg-Thyssen-Humpuss. $1,275 MM (U.S.). Completion: 1992-93.

***Cilacap, Java.** 375,000 mt/y ethylene, 225,000 mt/y propylene, 300,000 mt/y polyethylene, 180,000 mt/y polypropylene, 100,000 mt/y MEG units planned. Feed: naphtha, raffinate, residue. $1,500 MM (US). Completion: 1993.

270,000 mt/y paraxylene, 120,000 mt/y benzene, 11,220 mt/y aromatics, 23,000 LPG, 93,720 mt/y raffinate units under construction. Feed: naphtha. $416 MM (US). Contractor: JGC Consortium. Completion: 1990-1991.

***Pare-Pare, South Sulawesi.** 660,000 mt/y methanol plant. Feed: natural gas. $282 MM (US). Completion: 1992.

***Plaju, South Sumatra.** 75,000 purified terephthalic acid expansion. Feed: paraxylene. $60 MM (US). Contractors: Kellogg/Thyssen. Completion: Jan. 1991.

*30,000 mt/y polypropylene expansion. Feed: propylene. $40 MM (US). Completion: 1992.

PERTAMINA, BRITISH PETROLEUM, CHEVRON (Gulf Corp.). PT ARSETO. Cilegon, West Java. 300,000 mt/y polyethylene plant. Completion: 1991.

PT ARUN AROMATIK INDONESIA. Arun, Sumatra. 321,200 mt/y benzene, 39,700 mt/y orthoxylene, 180,000 mt/y cyclo hexane, 19,600 mt/y toluene, 217,200 mt/y mixed xylene, 254,000 mt/y LPG, 225,800 mt/y raffinate, 776,000 mt/y kerosine, 719,000 mt/y EPCC bottoms, and 676,000 mt/y depropanizer bottoms units. Completion: 1992.

PT ASEAN POLYMERS. Cilegon, West Java. 100,000 mt/y polypropylene plant. Completion: 1991.

PT POLYCHEM LINDO. Cilegon, West Java. 4,500 mt/y ABS resin and 1,500 mt/y AS resin units. Completion: 1990.

PT TRI POLYTA INDONESIA. Cilegon, West Java. 160,000 polypropylene plant. Completion: 1992.

PT YASINTA POLY. Tangerang. 42,000 t/y polyester polycondensation plant in engineering stage. Contractor: Zimmer. Completion: 1990.

IRAN

FIPCO. Esfahan. 60,000 mt/y dimethyl terephthalate plant under construction. Constractor: Krupp Koppers. Completion: 1990.

NATIONAL PETROCHEMICAL CO. Arak. 24,000 t/y acetaldehyde plant in engineering stage. Contractor: Uhde. Lic: Aldehyd. Completion: 1992.

30,000 t/y acetic acid plant in engineering stage. Contractor: Uhde. Lic: Hoechst. Completion: 1992.

30,000 t/y vinylacetate monomer plant in engineering stage. Contractor: Uhde. Lic: Bayer. Completion: 1992.

240,000 mt/y ethylene plant under construction. Contractor: TPL. Completion: Dec. 1991.

60,000 mt/y lld polyethylene plant under construction. Contractor: TPL. Completion: Sept. 1991.

60,000 mt/y hd polyethylene plant. $1.5 billion. Contractors: Technipetrol and KTI. Uhde on hd polyethylene. Completion: 1992.

Shiraz. 1,200 mt/d ammonia unit under construction. Contractor: Humphreys & Glasgow.

***Tabriz.** 136,000 mt/y olefins plant in engineering stage. Contractor: TPL. Completion: Dec. 1994.

136,000 mt/y ethylene plant in engineering stage. Contractor: KTI/TPL. Completion: 1991

IRAQ

IRAQ OIL. Central Iraq. South of Baghdad. $2 billion petrochemical complex No. 2. Products include: 450,000 mt/y ethylene (feed: naphtha); 160,000 t/y polyethylene; 100,000 t/y polypropylene; and 120,000 t/y polystyrene. Consult: Bechtel UK on ethylene unit. Proposed. Possible 1992.

***MINISTRY OF INDUSTRY. Beiji.** 1,000 mt/d ammonia and 1,250 mt/d urea expansion. Feed: natural gas. Contractor: MW Kellogg. Completion: 1992.

NATIONAL PETROCHEMICAL. Tabriz. 336,000 t/y Ethylene production plant. Contr: TPL. Completion: Oct. 1992.

Olefins plant in the engineering stage. Contr: TPL. Completion: Oct. 1992.

TECHCORPS. Central Iraq. South of Baghdad. 100,000 mt/y polypropylene plant under construction. Contractor: Tecnimont. Completion: 1991.

Latifia. 67,000 t/y Ethylene Oxide/Glycol Plant in the engineering stage. Completion: Sept. 1991.

TECHNICAL CORPS FOR SPECIAL PROJECTS. 70,000 t/y Butadiene Extraction plant. Contractor: Toyo Engineering Corp.

ISRAEL

***GADOT PETROCHEMICAL INDUSTRIES LTD. Haifa Bay.** 30,000 mt/y paraxylene plant. Feed: xylenes.

*30,000 mt/y paraxylene expansion. Feed: xylenes.

ITALY

ARCO CHEMICAL. Ravenna. 15-25 MM lb/y resins plant in engineering stage. Eng: JV/EniChem. Completion: 1990.

CHAMBAL FERTILIZERS AND CHEMICALS INC. Gadepan. 1,350 t/d Ammonia plant under construction. Contr: Snamprogetti. Completion: 1991.

1,125 t/d each, 2 Urea plants under construction. Contr: Snamprogetti. Completion: 1991.

ENICHEM. Manfredonia. Caprolactam revamping under construction. Contr: Snamprogetti. Completion: 1990.

1,400 t/y ammonia washing in the engineering stage. Engr: Techint. Sept. 1990.

Augusta. 240 t/d kerosine feed pretreatment expansion under construction. Eng: CTIP.

Brindisi. Ethylene plant. Contractor: Technipetrol. Completion: 1991.

***ENICHEM ANIC. Assemini.** 85,000 t/y acrylonitrile expansion in engineering stage. Contractor: TPL. Completion: July 1990.

IGI SUD. Manfredonia. 5,000 t/y Argon and Hydrogen recovery in the engineering stage. Dec. 1990.

MONTEDIPE. Porto Marghera. 141,000 Aromatic extraction, 35,000 Isoprene cut and 13,700 Dicyclopentadiene plant under construction. Contr: Tecnimont. Completion: 1990.

TERNI INDUSTRIE CHIMICHE SPA. Nera Montoro. 400 t/d Multipurpose Urea Granulation Plant under construction. Design: Snamprogetti. Completion: 1990.

JAPAN

***CHIBA POLYPROPYLENE CO. LTD. Chiba.** 60,000 mt/y polypropylene plant. Feed: propylene. Completion: early 1990.

DAICEL CHEMICAL INDUSTRIES LTD. Shizuoka. 20,900 t/y Formalin plant. Contractor: Toyo Engineering Corp. Lic: Mitsui Toatsu.

GENERAL SEKIYU K.K.. Sakai. 150,000 t/y para-xylene plant. 1990.

MITSUBISHI TOATSU CHEMICALS INC. Osaka. 1,000 t/d retrofit of ammonia converter. Engr: Toyo Engineering Corp. Lic: Kellogg.

MITSUBISHI PETROCHEMICAL CO. Kashima. 400,000 mt/y ethylene plant in the engineering stage. first half 1992.

***NIHON POLYSTYRENE CO. LTD. Kawasaki.** 30,000 mt/y polystyrene expansion under construction.

***OSAKA PETROCHEMICAL INDUSTRIES LTD. Takaishi-shi, Osaka.** 60,000 mt/y ethylene expansion. Feed: LPG, naphtha, heavy oil. Planned.

SHOWA DENKO K.K.. Ohita. Ethylene expansion. 1990.

KOREA

ARCO CHEMICAL and YUKONG LTD. Ulsan. 100,000 mt/y propylene oxide and 225,000 mt/y styrene units under construction. Contractor: Badger. Arco tech. Completion: Spring 1990.

270,000 mt/y ethylbenzene unit in engineering stage. Mobil-Badger Tech. Contractor: Badger. Completion: 1990.

***BP CHEMICALS.** Acetic acid plant planned.

DEMOCRATIC PEOPLE'S KOREAN REPUBLIC. 10,000 t/y ethylene oxide-glycol plant. $6.5 MM. Contractors: Japan Catalytic Chemical and Hitachi Shipbuilding & Engineering.

DONG SUNG CHEMICALS INDUSTRIES LTD. Korea. 20,000 t/y Butane Dioc in the engineering stage. Engr: Davy McKee. Completion: 1991.

HAN KOOK FIBRES CORP. Kyoung Buk. 70,000 t/y polyester polycondensation plant in engineering stage. Completion: 1990.

***HAN YANG CHEMICAL CORP. Yeochun.** 350,000 mt/y ethylene plant. Feed: naphtha. Product: BTX (80,000 mt/y). Contractor: Stone & Webster USA. Planned. Completion: March 1991.

*70,000 mt/y polyvinyl chloride plant under construction. Feed: vinyl chloride. Contractor: Kane Ka Fuchi. Completion: March 1990.

*70,000 mt/y polyvinyl chloride plant. Feed: vinyl chloride. Contractor: Kane Ka Fuchi. Planned. Completion: June 1992.

HYUNDAI PETROCHEMICAL. Daesan. 350,000 mt/y ethylene plant in engineering stage. Feed: naphtha, gas oil, LPG. Lic-eng: MW Kellogg. $300 MM. Completion: 1991.

100,000 mt/y ethylbenzene/styrene monomer plant in the engineering stage. Engr: Badger Engineers Inc. Completion: late 1990.

60,000 mt/y low linear density polyethylene plant in the engineering stage. $80 MM. Engr: John Brown. Completion: 1991.

57,000 mt/y Butadien Extraction plant. Contractor: Toyo Engineering Corp.

Ulsan. Styrene-butadiene-Acrylonitrile/Methyl Ethyl Ketone plant in the engineering stage. Engr: Edeleanu. Completion: 1992.

KOC. Korea. 300 t/d nitric acid plant. Contractor: Uhde Gmbh. Completion: 1991.

KOREA PETROCHEMICAL INDUSTRIES CO. LTD. Onsan. 250,000 mt/y polymer grade ethylene and 145,000 t/y propylene plant. Tech. Lummus Crest.

***KUMHO SHELL CHEMICAL CO. LTD. Yeochon.** 70,000 mt/y phenol expansion (total cap. 100,000 mt/y). Completion: 1990.

*42,000 mt/y acetone expansion (total cap. 60,000 mt/y). Completion: 1990.

8,500 mt/y resins, 10,000 mt/y solvents, 20,000 mt/y diphenylol propane units planned. $142 MM. Completion: 1990.

Yeochun. 35,000 mt/y acrylic acid, 32,000 mt/y acrylic ester expansions planned. Completion: Jan. 1990.

180,000 mt/y styrene plant. Design-eng: Lummus Crest. Tech: Monsanto/Lummus Crest.

NAM HAE CHEM. Korea. 300 t/d nitric acid plant. Contractor: Uhde Gmbh. Completion: 1990.

***SAMSUNG GENERAL CHEMICALS CO. LTD. Daesan.** Ethylbenzene/styrene monomer plant (180,000 mt/y styrene). Contractor: Badger Engineers.

SAMSUNG PETROCHEMICAL CO. LTD. Ulsan. 100,000 mt/y terephthalic acid expansion under construction. Feed: paraxylene. Contractor: Samsung. Completion: Feb. 1990.

Daesan. 180,000 mt/y ethylbenzene/styrene monmer plant in the engineerig stage. Contractor: Badger. Completion: 1990.

YUKONG LTD. Ulsan. 200,000 mt/y paraxylene, 50,000 mt/y orthoxylene units. Feed: xylene mix. Lic: UOP, Engelhard. Completion: Jan. 1990.

35,000 mt/y isopropanol plant and 50,000 mt/y secondary butanol/methyl ethyl ketone unit. $72 MM. Completion: 1992.

KUWAIT

KNPC. Mina Al-Ahmadi. 1,300 MTBE unit. Planned. Lic: UOP. Completion: end 1992.

90,000 mt/y polypropylene unit planned. Completion: end 1992.

PETROCHEMICAL INDUSTRIES. Shuaiba. *80,000 mt/y polypropylene unit. Feed: propylene. Lic: Union Carbide. Completion: 1992.

100,000 mt/y polypropylene unit. Feed: propylene. Planned. Completion: 1991.

LIBYA

NATIONAL PETROCHEMICAL COMP. Marsa el Brega. 200 mt/d expansion of their ammonia plant in the engr. stage. Contractor: Uhde. Completion: 1990.

MALAYSIA

ASEAN BINTULU FERTILIZER SDN. BHD. Bintulu. 200 t/d ammonia expansion. Design: Uhde. Completion: 1990.

***BORDEN CHEMICAL (M) SDN. BHD. Prai Industrial Estate.** 16,000 mt/y formaldehyde unit planned. Feed: methanol. Completion: 1990.

BP CHEMICALS. Low linear density polyethylene plant. Planned.

EXXON CHEMICAL CO. Kerteh. 450,000 t/y ethylene and 450,000 polyethylene plant awaiting gov't approval. Completion: 1994.

MTBE MALAYSIA. Kuantan. (joint venture with Petronas, Idemitsu Petrochemical, and Neste Oy) 84,000 t/y polypropylene and 300,000 MTBE plants planned. Completion: early 1990's.

PETROLIAM NASIONAL BHD. seeking bids for three plants.

300,000 mt/y MTBE plant.
80,000 mt/y Propylene plant.
80,000 mt/y Polypropylene plant.

POLYPROPYLENE MALAYSIA. Kuantan. (joint venture with Petronas, Idemitsu Petrochemical, and Neste Oy) 80,000 mt/y polypropylene plant. Planned.

SHELL MDS (MALAYSIA). Bintulu. 500,000 t/y Middle Distillates Synthesys. Contr: JGC. 1992.

TITAN POLYPROPYLENE (MALAYSIA) SDN. BHD.. Johor. 100,000 mt/y Polypropylene. Contr: JGC. 1991.

MEXICO

CELANESE MEXICANA. Cangrejera, Veracruz. 60,000 mt/y vinyl acetate plant. Feed: ethylene, acetic acid. Completion: 1991.

100,000 mt/y butyraldehyde, 5,400 isobutyraldehyde units. Feed: propylene. Completion: 1991.

DERIVADOS MALEICOS SA DE CV. Apizaco, Tlaxcala. 15,000 mt/y maleic anhydride unit. Feed: benzene. Completion: end 1992.

FERTILIZANTES MEXICANOS. Camargo. 1,500 t/d urea plant under construction. Contractor: Snamprogetti. Completion: 1990.

Lazaro Cardenas. 1,500 t/d urea plant under construction. Contractor: Snamprogetti. Completion: 1990.

***INDUSTRIAS DERIVADAS DEL ETILENO SA de CV. Apizaco, Tlaxcala.** 25,000 mt/y oxoalcohols plant under construction. Feed: propylene. Completion: 1990.

15,000 mt/y ethanolamines unit under construction. Feed: ethylene oxide. Completion: 1990.

PEMEX.

Camargo, Chihuahua. 1,500 mt/y ammonia unit under construction. Feed: natural gas. Lic-eng: MW Kellogg. Completion: 1990.

Cosoleacaque, Ver. 825,000 mt/y methanol unit in engineering stage. Contractor: Uhde-IMP. Completion: Dec. 1990.

***Morelos.** 100,000 mt/y hd polyethylene unit under construction. Feed: ethylene.

500,000 ethylene unit under construction. Feed: refinery gas.

350,000 mt/y propylene unit under construction. Design: Air Products. Completion: 1991.

75,000 isopropyl alcohol unit in engineering stage. Completion: 1991.

100,000 mt/y butadiene unit in engineering stage. Completion: 1990.

PEQUIVEN. El Tablazo, Zulia. 130,000 mt/y EDC/VCM plant. Lin: Uhde GmbH.

SINTESIS ORGANICAS SA DE CV. Apizaco, Tlaxcala. 15,000 mt/y plastizicers unit. Feed: 2-ethyl hexanol. Completion: end 1992.

NETHERLANDS

DSM. South Limburg. 22,000 mt/y polyamide 46 unit. Completion: 1990.

DOW CHEMICAL. Terneuzen. 200,000 ethylene plant in the engr. stage. Contractor: Kinetics Tech. Inter. Completion: 1990.

EXXON CHEMICAL. Rotterdam. Expansion of their paraxylene plant in the engineering stage. $10 million. Contractor: John Brown. Completion: 1990.

GENERAL ELECTRIC. Bergen op zoom. 0.9 - 1.1 MMscfd carbon monoxide plant. Engr: Kinetics Tech. Inter. Contractor: General Electric. Completion: 1990.

G. E. PLASTICS. Bergen op zoom. New BPA plant under construction. $180 million. Contractor: John Brown. Completion: 1990.

NEW ZEALAND

PETRALGAS CHEMICALS NZ LTD. Waitara. 1200 mt/d crude methanol distillation plant. Engr:Uhde GmbH. Completion: 1990.

NIGERIA

NIGERIAN NATIONAL PETROLEUM CORP. Port Harcourt, Rivers state.

Petrochemical complex comprising:

400,000 mt/y ethylene, 100,000 mt/y propylene, 270,000 mt/y polyethylene, 35,000 mt/y ethylene glycol, 70,000 mt/y polypropylene, 15,000 mt/y butene 1, 100,000 chlorine-caustic soda, 145,000 m/ty vinyl chloride monomer, 140,000 mt/y polyvinyl chloride, 30,000 mt/y plasticizers, 26,000 m/ty 2 ethylhexane, 15,000 mt/y phthalic anhydride. $2 billion. Consult-manage-supervisor: Foster Wheeler. Completion: 1990.

Eleme. Phase Two of petrochemical complex. Polyethylene plant. $1.2 billion. Contractors: Du Pont Canada and IFP.

NORWAY

Statoil. Antwerp. 400,000 mt/y propylene plant and a 180,000 mt/y polypropylene unit. pr: 1990, po: 1991.

Den norske stats oljeselskap AS. Bamble. 40,000 expansion of their high density polyethylene plant. $23.9 MM.

OMAN

***Oman government.** 2,220 mt/y floating methanol plant. $250 MM. Tenders out. Completion: 1991.

PHILIPPINES

***PHILIPPINE BOARD OF INVESTMENT.** Approved in principal to build the first petrochemical complex in the Philippines in either Batangas or Bataan. Contractor: USI Far East Corp.

SAUDI ARABIA

***ARABIAN PETROCHEMICAL CO. Al Jubaul.** 133,000 mt/y Benzene plant in the engineering stage. Design: Air Product. Completion: 1991.

***AL-JUBAIL PETROCHEMICAL CO. Jubail Industrial City.** 40,000 mt/y polyethylene expansion under construction. Feed: ethylene. Contractors: Zate, John Brown. Completion: mid 1990.

IDN-AL-BAYTAR. Madinatal-Jubail al Sinaiyah. 1,500 t/d Urea plant under construction. Design: Snamprogetti. Completion: 1990.

MOBIL CHEMICAL CO./SAUDI BASIC INDUSTRIES CORP. Yanbu. expansion. installation of 2 ethylene furances, raising polyethylene by 50,000 mt/y and ethylene glycol by 80,000.

NATIONAL CHEMICAL FERTILIZER CO. Al-Jubail. 1,500 urea plant under construction. Contractors: Snamprogetti and TPL. Completion: May 1990.

SOUTH AFRICA

***NATIONAL CHEMICAL PRODUCTS LTD. Durban.** 6,000 t/y maleic anhydrice plant under construction. Feed: butane. $17 MM U.S.

SPAIN

ATOCHEM. Prat de Llobregat. 120,000 t/y polyvinyl chloride plant. $60 MM. Planned. Completion: 1990-1991.

20,000 t/y polystyrene expansion planned (75,000 mt/y total cap.).

BASF ESPANOLA SA. Tarragona. 50,000 mt/y polypropylene plant. $130 MM. Completion: late 1990.

BAYER HISPANIA INDUSTRIAL SA. Tarragona. Expansion of the following: 36,000 mt/y isocynates, 11,000 mt/y ABS/SAN resins, 1,200 mt/y synthetic latex. $80 MM. Completion: 1991.

BP CHEMICALS LTD./CIA. ESPANOLA DE PETROLEOS SA. San Roque. 30,000 mt/y maleic anhydride plant. $50 MM. Completion: 1991.

CEPSA. San Roque, Cadiz. 40,000 mt/y maleic anhydride plant. $30 MM. Completion: 1990.

Algeciras. 45,000 mt/y MTBE unit. Lic: UOP.

***DOW CHEMICAL IBERICA SA. Bilbao.** $15 million upgrading and modernizing of polystyrene and styrene-butadiene latex plants. Completion: early 1990.

E.I. du PONT de NEMOURS INC. Barcelona. Polymers/composite materials plant. $80 MM. Completion: 1992.

***ENFERSA. Cartagena, Murcia.** 15,000 mt/y urea revamp planned. Feed: ammonia. Completion: 1990.

Puertollano. 420 t/d urea expansion under construction. Feed: ammonia. Contractor: Snamprogetti. Completion: 1990.

GE PLASTICS DE ESPANA SA. Cartagena. acrylonitrile butadiene styrene plant. $2.5 billion. Contractor: Foster Wheeler Iberia SA.

HIMONT (Hercules Inc. and Montedison SpA). 25,000 mt/y polypropylene plant. Planned.

***POLIPROPILENO DE GALICIA SA. El Ferrol.** 50,000 mt/y polypropylene plant planned. Completion: early 1991.

***PRODUCTOS QUIMICOS DEL MEDITERRANEO SA.** 20,000 t/y caprolactam expansion. Feed: cyclohexane. Planned.

***REPSOL PETROLEO. La Coruna.** 160,000 mt/y Hydrogenation Butadiene plant. Completion: 1991.

800,000 mt/y Vacuum Asphalt. Contractor: Repsol/Sener. Completion: 1990.

38 MW/ 75 mt/hr steam, Cogeneration plant. Contractor: Repsol/Tr.

Puertollano. 20,000 mt/y styrene expansion. Planned.

25,000 mt/y polypropylene expansion. Planned.

130,000 mt/y alkylation unit. Contractor: Phillips. Completion: 1991.

Tarragona. 27,000 mt/y Propylene plant. Completion: 1991.

1,400 mt/d Olefins unit being revamped. Contractor: Repsol/Linde.

250,000 mt/y Fractionation Gasoline Pyrolysis. Contractor: Repsol.

TARRAGONA QUIMICA SA. Tarragona. 25,000 mt/y hd polyethylene expansion (125,000 mt/y total cap.) $65 MM.

SWEDEN

NOBEL CHEMATUR. Stenungsund. 40,000 mt/y ethylene unit (from ethanol) in engineering stage. Design: Scientific Design.

***STATOIL PETROKEMI AB. Stenungsund.** 30,000 mt/y ethylene expansion. Feed: propane. Completion: mid 1990.

TANZANIA

KILWA AMMONIA CO. Kilwa Masoko. $400 MM ammonia plant. Feed: natural gas (from Songo Songo Island field).

THAILAND

ICI INDUSTRIES plc AND SAHA UNION. Rayong province. (joint venture) 205,000 b/d purified terephthalic acid plant. Planned. Completion: 1992.

PETROLEUM AUTHORITY OF THAILAND.

Rayong. Petrochemical complex 2: 500 MM lb/y aromatics and olefins. Eng. study/contractors: Bechtel and Chem Systems. $1 billion. Completion: 1992.

THAI CHAROEN POKPHAND GROUP. Ma Ta Phut. (joint venture with Solvay Group) 135,000 mt/y polyvinyl chloride plant. Contractor: Solvay.

THAI PETROCHEMICAL INDUSTRY CO. LTD. Rayong. 80,000 mt/y polypropylene plant in engineering stage. Contractor: Uhde. Lic: BASF. Completion: 1990.

10,000 MT/y ABS resins plant under construction. Contractor: Sumitomo Chemical. Completion: May 1990.

THAI PLASTIC AND CHEMICAL CO. LTD. Rayong. 140,000 mt/y vinylchloride monomer, 26,000 mt/y caustic soda, 60,000 mt/y polyvinylchloride in engineering stage.Contractor: TEC. Completion: late 1990.

TRINIDAD

CARIBBEAN METHANOL CO. Point Lisas. 550,000 t/y methanol plant planned. Completion: early 1992.

GOVERNMENT OF TRINIDAD-TOBAGO (51%), **MW KELLOGG** (24.5%), **NORSK HYDRO** (24.5%). **Point Lisas.** 1,500 mt/d ammonia plant. Contractor: Kellogg.

TURKEY

TURKISH PETROLEUM REFINERIES CORP. Kilikkale. 23 mmscfd Hydrogin. Contr: JGC. 1992

UNITED KINGDOM

BITMAC. Southampton. 2,000 mt/y phthalic anhydride expansion in engineering stage. Contractor: Lurgi.

***BP CHEMICALS LTD. Hull. Grangemouth, Scotland.** 270,000 mt/y ethylene expansion planned.

100,000 mt/y hd polyethylene expansion in engineering stage (250,000 mt/y total capacity).

600,000 total capacity of olefins. Design: Stone & Webster Engineering Corp.

***Hythe.** 3,000 mt/y dimethyl terephthalate plant under construction. Completion: 1990.

ENICHEM ELASTOMERS LTD. Hythe. 60,000 mt/y styrene modernization in engineering stage. Process design: Badger. Completion: 1990.

EXXON CHEMICAL LTD. Fife. hiking ethylene capacity to 900,000 mt/y and adding a polymer grade propylene capacity of 180,000 mt/y. $316 MM. Completion: 1992.

HUNTSMEN CHEMICAL CORP. Carrington. 50,000 mt/y polystyrene unit. Lic: Huntsman. Contractor: Lummus Crest BV. Completion: 1990.

ICI. (Chemicals, Polymers Group). **Wilton.** 60,000 mt/y terephthalic acid expansion under construction. Feed: paraxylene. Completion: 1990.

SHELL CHEMICALS UK LTD. Carrington. 130,000 mt/y polypropylene plant under construction. Lippshac process. £48 MM. Lic-eng-con: MW Kellogg Ltd. Completion: 1990.

Stanlow. 160,000 mt/y ethylbenzene plant in engineering stage. Process design: Badger. Completion: 1990.

TIOXIDE UK. Titanium Dioxide plant under construction. Contr: Simon-Craves 1990.

U.S.S.R.

Budyennovsk. 100 mt/y polypropylene in engineering stage. $146 MM. Contractor: John Brown. Completion: 1990.

Dzerzhinsk. 25,000 mt/y acrylic acid, 40,000 mt/y acrylic esters, 40,000 mt/y acrylic emulsions in engineering stage. Processes: Nippon Shokubai KK, Dainippon Ink. Consortium coordinator: Nissho Iwai. Contractor: Mitsubishi HI. Completion: March 1991.

Kazan. 200,000 mt/y polyethylene expansion. Union Carbide technology. Contractor: John Brown.

MINISTRY OF THE PETROCHEMICALS INDUSTRY AND ENI. Lithuania. (joint venture) 350,000 mt/y MTBE and 150,000 mt/y alkylates plant. Planned.

Mogilev. 25,000 mt/y dimethyl terephthalate expansion in engineering stage. Contractor: Krupp Koppers. Completion: 1990.

Nizhnevartovsk, Siberia. Petrochemical complex. Feed: ethylene. $5 billion. Feasibility study: Mitsubishi, Mitsui, Chiyoda. Completion: Late 1990s.

Polotsk. 60,000 t/y ethylene-propylene and 55,000 t/y acrylonitrile.

PRESSINDUSTRIA. Tobolsk. 90,000 t/y Butyl Rubber plant in the engineering stage. Contr: Techint. Completion: Dec. 1992.

***SOVIET MINISTRY OF THE CHEMICAL INDUSTRY. Shevchenko.** Petrochemical complex. Contractors: Dow Europe-Litwin. Feasibility study.

***TECHMASHIMPORT. Budennowsk, Caucasus.** 100,000 mt/y ethylene expansion at Stavropol polymer complex. Contractor: Linde AG.

Budyennorsk. 100,000 mt/y Polypropylene expansion in the engineering stage. $60 MM. Completion: 1992.

Blagoveshchensk. 230,000 mt/y pure terephthalic acid in engineering stage. Contractor: MES. Completion: 1992.

Mogilev. 25,000 mt/y dimethyl terephthalate modernization, expansion in the engineering stage. Contractor: Krupps Koppers. Completion: 1992.

Nevinnonysk. 150,000 mt/y acetic acid under construction. Contractor: MES. Completion: 1990.

***Voronej.** 30,000 mt/y thermoplastic styrene-butadiene elastomers plant planned. Contractor: Litwin SA France. Completion: 1991.

500,000 t/y ethylene revamping. Contractor: Toyo Engineering Corp.

VENEZUELA

CORPOVEN. El Palito. 2,500 b/d revamp BTX unit. Eng-lic: UOP. $100 MM. Completion: 1990.

Anzoategui. 400 MMcfd expansion for their gas processing capacity.

DOW CHEMICAL CO. El Tablazo. 150,000 mt/y styrene monomer plant. $120 MM. (joint venture with Petroquimica de Venezuela and Grupo Zuliano).

NITRORIENTE. Anzoátegui. 495,000 mt/y ammonia unit. Lic-eng: Braun. $250 MM. Completion: 1991.

PEQUIVEN. Anzoategui. 750,000 mt/y methanol plant (joint venture with Mitsubishi Corp.).

660,000 mt/y methanol plant. (joint venture with Ecofuel).

500,000 mt/y methyl tertiary butly ether plant. (joint venture with Ecofuel).

Carabobo. 363 mt/y urea unit. Lic-eng: Snamprogetti. $72 MM. Completion: 1991.

Zulia. 150,000 mt/y ethylene dichloride and 130,000 mt/y of vinyl chloride monomer. $190 MM.

150,000 mt/y linear low density polyethylene plant. $200 MM. (joint venture with Combustion Engeering Inc. of Canada).

PLASTILAGO. Zulia. 30,000 mt/y Polyethylene. $12MM revamp. Lic: Mitsui. Completion: 1990.

***El Tablazo, Zulia.** 150,000 mt/y ethylene dichloride, 130,000 mt/y vinyl chloride monomer. Eng: Uhde GmbH. $190 MM.

Olefins plant (350,000 mt/y ethylene and 220,000 t/y propylene). Planned. Feed: ethane. $241 MM. Tech: Linde AG. Contractors: Ferrostaal, DSD-CGI, Marshall y Asociados, Proyecta. Completion: 1991.

80,000 mt/y polyvinyl chloride and 100,000 mt/y vinyl chloride monomer units planned. Feed: vinyl chloride. $248 MM. Eng: Snamprogetti. Completion: 1990.

60,000 mt/y ethylene dichloride and vinyl chloride units planned. Feed: ethylene, chloride. Completion: 1992.

Jose, Anzoategui. 500,000 mt/y MTBE unit in engineering stage. Feed: Butanes, methanol. Catofin process. Contractor: Snamprogetti. Completion: 1990.

495,000 mt/y ammonia unit. Feed: natural gas. Eng: Braun. Completion: 1990

Morón, Carabobo. 495,000 mt/y ammonia unit planned. Lic/eng: Braun. Feed: natural gas. Completion: 1991.

247,500 mt/y urea unit planned. Feed: ammonia. Completion 1991.

308,000 mt/y solution urea. Feed: ammonia. Planned. Completion: 1991.

PETROPROPANO DE VENEZUELA S.A. Jose. (joint venture of Petroquimica de Venezuela and Veba Oel AG) 250,000 mt/y propylene unit. Feed: propane. Eng-design: UOP.

PETROQUIMICA DE VENEZUELA. Eastern Venezuela. 660,000 mt/y methanol plant. $200 MM. Engr: Ecofuel of italy.

PLASTILAGO. Zulia. 30,000 mt/y hd polyethylene revamp. Lic: Mitsui. $12 MM. Completion: 1990.

PRALCA. Zulia. 30,000 mt/y ethylene oxide-ethylene glycol units. Lic. Olin. Eng: Pequiven-Corimon. $41 MM. Completion: 1990.

PROPILVEN SA. El Tablazo, Zulia. (Pequiven, Grupo Zuliano, Mitsui Petchem., Promotora Venoco). 70,000 mt/y polypropylene unit in engineering stage. Feed: propylene. $85 MM. Eng: Technipetrol-Inelectra. Completion: Dec. 1990.

SUPER OCTANOS C.A. 500,000 t/y MTBE plant under construction. Contractor: Snamprogetti. Completion: 1991.

Jose. 320,000 mt/y Isobutylene plant under construction. Design: Air Product. Completion: 1991.

YUGOSLAVIA

PROGRES PRIZREN. Prizren. 7,000 mt/y polyamide 6 polymerization unit in engineering stage. Contractor: Zimmer Ag.

Sulfur — WORLDWIDE CONSTRUCTION

*Designates projects listed for the first time in the Journal.

UNITED STATES

ARCO PRODUCTS CO. Los Angeles. 100 t/d from refinery gas. Flour Daniel. Summer 1990.

ASHLAND PETROLEUM. Catlettsburg, Ky. 203.2 mt/d Claus unit (from refinery). Engr: Pritchard. Contr: Foster Wheeler. Completion: Spring 1991.

CHEVRON USA. Rangely, Colo. 60 MMcfd expansion. Compression only. Completion: June 1990.

PENNZOIL PRODUCTS. Roosevelt, Utah. 0.35 t/d Locat unit.

SHELL OIL. Anacortes, Wash. 17 mt/d design (from refinery).

Denver City, Tex. 5 mt/d design (from natural gas).

QUANTUM. Deer Park, Tex. 17,500 t/y acetylene recorvery unit under construction. contractor: Linde. Completion: 1990.

BELGIUM

NV TESSENDERLO CHEMIE. Ham. 1,000 t/d sulfuric acid plant under construction. Contractor: Simon-Carves. Completion: 1990.

BRAZIL

PETROBRÁS. Araucaria, PR. 65 mt/d unit (from refinery). Staff. Completion: 1992.

Canoas, RS. 35 mt/d unit (from refinery). Staff. Completion: 1992.

Cubatao, SP. 70 mt/d unit (from refinery). Staff. Completion: 1991.

Mataripe, BA. 40 mt/d unit (from refinery). Planning.

Paulínia, SP. 64 mt/d unit (from fuel gas and LPG desulf). Eng: Promon. Lic: Kellogg. Con: Staff. Completion: 1991.

Sáo Mateus do Sul, PR. 100 mt/d unit (from retorted shale gas). Staff. Completion: 1990.

CANADA

AMOCOCANADA PETROLEUM CO. LTD. Nipisi Central Facilities. 20 MMCFD. Compression Dehydration process method. Approval Stage. Completion: Feb. 1990.

MOBIL OIL CANADA. Rainbow, Alta. 20 MMcfd. Compression expansion process method. Engineering stage. $4.7 MM (US). Completion: 1990.

SHELL CANADA. Caroline, Alta. 3,000-4,000 t/d plant in engineering stage. Contractor: Partec Lavalin. Completion: 1991.

CHINA

PANZHIHUA IRON & STEEL WORKS. Dukou. 8,000 mt/y sulfuric acid plant under construction. Contractor: Krupp Koppers. Completion: 1990.

SHIJIAZHUANG COKING PLANT. Shijiazhuang. 3,000 mt/y Claus unit under construction. Contractor: Krupp-Koppers. Completion: 1990.

CHINA, TAIWAN

CHINESE PETROLEUM CORP. Tao Yuan. 100 mt/d design (from refinery gas). Amoco process. Contractor: Chiyoda. Completion: mid 1990.

Tor, Kor. 972 t/d sulfur degassing unit in the engineering stage. Design: Comprimo. Completion: 1990.

CZECHOSLOVAKIA

PKAZ. 34 MMcfd unit under construction. Sulfint process. Contractor: Integral.

DENMARK

STATOIL A/S. Kalundborg. 17.5 t/d MEA and sulfur recovery units in engineering stage. Contractor: TPL. Completion: Feb. 1990.

GERMANY, EAST

IAI. Rummelsburg, East Berlin. Flue gas desulfurization unit in engineering stage. Wellman Lord Process. £42 MM. Contractor: Davy McKee. Completion: 1990.

GERMANY, WEST

MOBIL OIL AG. Woerth. Two-stage Claus sulfreen unit. Contractor: Lurgi.

RHEINISCHE OLEFINWERKE. Wesseling. 90,000 mt/y expansion olefin plant in the engineering stage. tech: Linde. Completion: 1991.

VEBA OEL AG. Gelsenkirchen. 440,000 mt/y olefin plant in the engineering stage. contractor: Linde. Completion: 1992.

IRAN

NIOC. Bandar Abbas. 210 t/d unit in the engineering stage Contractor: Comprimo. Completion: 1990.

ISRAEL

***OIL REFINERIES LTD. Ashdod.** 60 mt/d Claus TGT unit. Feed: FCC. Completion: 1992.

ITALY

EXXON. Augusta. 100 t/d sulfur recovery unit in the engineering stage. Engr: Tchint. Completion: May 1990.

JAPAN

YUKONG LTD. Ulsan. 400 t/d sulfur plant in the engineering stage. Design: Comprimo. Completion: 1990.

400 t/d sulfur degassing unit in the engineering stage. Design: Comprimo. Completion: 1990.

KUWAIT

KUWAIT NATIONAL PETROLEUM. Mina Al-Ahmadi. 100 t/d sulfuric acid regen. unit planned. Completion: end 1992.

MEXICO

PEMEX. Ciudad Pemex, Tab. 323.3 mt/d (from natural gas). Planning.

Matapionche, Ver. 27.1 mt/d Claus unit (from natural gas) under construction.

Salina Cruz, Oax. 32.9 mt/d Claus unit (from refinerygas). Engineering stage. Completion: 1991.

Tula, Hgo. 32.9 mt/d Claus unit (from refinery gas.) Under construction. Completion: 1991.

SWITZERLAND

RAFFINERIE DE CRESSIER SA. Neuchatel. 25 t/d expansion in the engineering stage. Contractor: Comprimo. Completion: 1990.

THAILAND

BANGCHAK PETROLEUM CO. LTD. Bangkok. 30 t/d in the engineering stage. Design: Comprimo. Completion: 1990.

TURKEY

***TÜPRAS. Izmir.** 70 mt/d Claus unit (from refinery gas). Completion: 1993.

TURKISH PETROLEUM REFINERIES CORP. Kirikkale. 52 mt/d Claus unit (from refinery gas). Contr: JGC. Completion: 1992.

U.S.S.R.

STAVROPOL POLYMER. Budyennovsk. 100,000 mt/y expansion of their olefin plant in the engineering stage. Tech: Linde. Completion: 1992.

YUGOSLAVIA

INA—NAFTAPLIN. Molve. 180 MMSCFD MDEA, NGL recovery Dehy, Lo-Cat Sulfur recovery in the engineering stage. Engr: Pritchard. Completion: 1990.

Gas Processing — WORLDWIDE CONSTRUCTION

*Designates projects listed for the first time in the Journal.

UNITED STATES

ARCO ALASKA INC. Anchorage. GHX-1 expansion of Prudhoe Bay field gas handling facilities. Design: RM Parsons. Completion: 1990.

ARCO OIL & GAS. Fruitland, Colo. Gas gathering Dehydration. 1990.

AMOCO PRODUCTION CO. San Juan County, Colo. Treating, compression & dehydration plant under construction.

AMERADA HESS. Tiogaa, N.D. Expansion of their treating facility under construction.

B.P. EXPLORATIONS. Prudhoe Bay, Alas. Expansion of their Gas Handling System in the engineering stage. Engr: Parsons. Completion: 1990.

CHEVRON U.S.A. INC. 60 MMcfd expansion-Train 3. Design stage. Compression only. Completion: June 1990.

***COASTAL JAVELINA INC. Corpus Christi, Tex.** $104 MM plant that will recover 26,000 b/d of ethylene, ethane, propylene, propane, butanes, and hydrogen from 145 MMcfd of off-gas from area refineries. Completion: July 1990.

***COASTAL OIL & GAS. Corpus Christi.** relocation. Contr: Fish. 1991.

PANHANDLE EASTERN CORP. Liberal, Kan. $25 million upgrade to extract 800 MMcf/y of crude helium. (joint venture with Air Products & Chemicals Inc.).

TEXACO INC. Erath, La. 10,000 bbl expansion. Debutanizer. Under construction.

ARGENTINA

YACIMIENTOS PETROLEUM FISCALES. Campo Duran. 565 MMscfd expansion in engineering stage. Product: LPG. Eng-design: Fish. Completion: 1990.

AUSTRALIA

WESFARMERS LPG PL. Kwinana. 282.5 MMcfd plant. 190,000 mt/y LPG. Contractors: Randall Corp., Clough Eng., T. O'Connor & Sons PL-Adelaide.

WOODSIDE OFFSHORE PETROLEUM PtL. Withnell Bay, Burrup Peninsula (near Karratha). 2 MM mt/y LNG train No. 3 in design stage. 6 MM tons LNG total capacity.Contractors: Kellogg-JGC-Kaiser. $900 MM. Completion: 1993.

BAHRAIN

BAHRAIN NATIONAL GAS CO. Jebel Al Dukhan. 110 MMscfd LPG plant in engineering stage. 111,888 g/d propane, 70,518 g/d butane, 154,434 g/d naphtha. Refrig-absorp (lean oil) method. Consult: Lummus Crest BV. Contractor: JGC. Completion: Aug. 1990.

BANGLADESH

***BAKHRABAD GAS SYSTEMS LTD. *Feni gas field.** 40 MMscfd solid desicant gas dehydration plant. Planned.

BRAZIL

Lagoa Parda 2, Espirito Santo. 17,400 MMcfd plant. 37,800 g/d LPG, 12,100 g/d pentanes plus. Refrigeration-absorption method. Completion: Feb. 1990.

CANADA

***Leismer West, Alta.** Compression expansion to 55 MMcfd planned. Completion: May 1990.

***Nipisi, Alta.** 20 MMcfd expansion in approval stage. Completion: Feb. 1990.

***COHO RESOURCES LTD. Calgary.** 37 MMcfd plant subject to approval. $11 million. Completion: Feb. 1990.

GULF CANADA. Strachan, Alta. Ethane recovery, NGL treating revamp and expansion in engineering stage. Design: Partec Lavalin. Completion: 1990.

***MOBIL OIL CANADA. Rainbow, Alta.** 20 MMcfd plant in engineering stage. Compression expansion method. $4.7 MM (US). Completion: 1990.

PLACER CEGO PETROLEUM. Medicine Lodge, Alta.

20-30 MMcfd plant. Preliminary design stage. Completion: mid 1991.

SHELL CANADA. Caroline, Alta. 300 MMcfd expansion in engineering stage. Des/eng: Partec Lavalin. Completion: 1991.

***Wabasca plant, Atla.** 15 MMcfd expansion. Compression only. Completion: Jan. 1990.

***Willesden Green plant, Alta.** 15 MMcfd expansion that includes 31,093 g/d LPG, 5,600 g/d pentanes plus. Refrigeration process method. Completion: Fall 1990.

TOTAL PETROLEUM CANADA LTD. Alta. 36 MMcfd plant. Amine sweetening method. 31.8 MMcfd sales gas, 22,722 g/d LPG mix, and 26,964 g/d condensate. Completion: Jan. 1990.

CHINA

HONG KONG AND CHINA GAS CO. Hong Kong. 1,400 cum/d, Expansion of their British Gas gas process in the engineering stage. Contractor: Babcock

Shenzhen City, Guangdong. $150 MM processing complex. Capacities will be 86,200 mt/y LPG, 70,000 t/y polypropylene, 100,000 t/y gasoline.

Zhongyuan field. 45 MMscfd turboexpander associated gas plant. 50,000 mt/y ethane, 48,000 mt/y propane, 42,000 mt/y gasoline, 30 MMscfd dry gas. Lump sum contract: Linde.

COLOMBIA

ECOPETROL. Apiay. 18.4 MMcfd plant. 31,000 g/d LPG mix, 9,500 g/d debutanized natural gas. Refrigeration method. Engineering stage. Contractor: Technipetrol. Completion: Jan. 1990.

15 MMSCFD. LPG recovery from natural gas. Transfer of residual gas into a pipeline to Bogota. Contractor: Tech. Completion: March 1990.

EGYPT

***BAPET CO.** (joint venture between EGPC & Shell). **Western Desert.** 180 MMcfd plant in detailed engineering stage. 142,800 g/d condensate. Cryogenic expander process method. Contractors: Bechtel, Petrojet. Completion: June 1990.

***EGYPTIAN GENERAL PETROLEUM CO. Ameriya.** 250 MMcfd plant in engineering stage. 112,354 g/d LPG, 41,580 g/d condensate, 19 MMcfd C_2/C_3 mix. Completion: Mar. 1992.

***GPC.** (EGPC affiliate). **Abu Sennan, Western Desert.** 85 MMcfd plant in detailed engineering and procurement stage. 189,000 g/d condensate. Refrigeration process method. Contractor: ENPPI. Completion: Aug. 1990.

FRANCE

ARCO CHEMICAL EUROPE. Fos-sur-mer. 140% expansion. Polyols, desobutanizer debottlenecking and TBA/MTBE debottlenecking. Engr. stage. Contractor: Foster Wheeler Francaise. Completion: 1990.

NORSOLOR. Chaling. Polystyrene plant in engineering stage. Contractor: Foster Wheeler Francaise. Completion: 1991.

INDIA

GAS AUTHORITY OF INDIA LTD. Auraiya, Uttar Pradesh. $1.38 billion separation plant. Planned.

Guna, Madhya Pradesh. $490 MM gas processing plant. Planned.

OIL & NATURAL GAS COMMISSION. Gandhar and Mehsana, Gujarat; Lakwa, Assam; offshore Krishna-Godavari basin; Agartala basin, Tripura. Five gas processing plants. 500,000 mt/y LPG.

INDONESIA

PERTAMINA. Bontang, East Kalimantan. Badak III. 1.5 MMt/y LNG train. Completion: 1990.

TOTAL INDONESIE. Tambora-Tunu fields, East Kalimantan. 250 MMcfd plant under construction. 400,000 g/d raw NGL mix. Absorption-glycol method. Completion: 1990.

ITALY

SNAM SpA. Panigaglia. 11 MM cum/d LNG expansion under construction. Contractor: Snamprogetti. Contractor: Snamprogetti. Completion: 1990.

LIBYA

MOBIL OIL. 15,000 b/sd oil separation plant in engineering stage. Contractor: FW Italiana.

OCCIDENTAL. Hakim. 24,000 b/sd oil separation plant in engineering stage. Contractor: FW Italiana.

SIRTE OIL. 40,000 b/sd oil, 155 MMcfd gas separation-treating plant in engineering stage. Contractor: FW Italiana.

MALAYSIA

PETRONAS. Kerteh, Terengganu. 250 MMcfd expansion. 35 MMscfd ethane, 500,000 propane, 290,000 butane, 280,000 pentanes plus. Eng: TEC. Cryogenic expander method. Completion: 1990's.

MEXICO

PETROLEOS MEXICANOS. Cadereyta, NL. 4,000 b/d NGL fractionation unit under construction.

Morelos, Ver. 11,806 b/d NGL fractionation unit under construction.

Nuevo Pemex, Tab. 500 MMcfd plant under construction. Process method: cryogenic.

24,000 b/d LPG sweetener under construction.

24,000 b/d LPG sweetener.

NETHERLANDS

NAM. Dalen. 1.25 MM t/d natural gas treatment plant in the engineering stage. Design: Comprimo. Completion: 1990.

NOGAT BV. Den Helder. gas treatment plant in the engineering stage. Contractor: Comprimo BV. (joint venture of NAM, Petroland Group and Energie Beheer Nederland.) Completion: 1991.

NEW ZEALAND

SHELL BP AND TODD OIL SERVICES LTD. Maui, Taranaki. C_6+ expansion. Products: 43,804 g/d LP mix, 21,400 g/d condensate. Completion: Jan. 1993.

NIGERIA

NIGERIA LNG LTD. Benny Island. 4 MM tonnes LNG. early 1995.

OMAN

AL FURAT PETROLEUM CO. Omar field. 130 MMcfd gas plant. Completion: mid 1991. (joint venture of Syria Shell, Shell Pecten, Deminex and Syrian Petroleum Co.)

PAKISTAN

***OIL & GAS DEVELOPMENT CORP. Lashari field.** 30 MMscfd gas dehydration unit. TEG process mehtod.

***Pirkoh field.** 100 MMscfd gas dehydration unit. TEG process method.

PERU

PETROLEOS DEL PERU. Aguaytia-Ucayali. 30 MMcfd plant. 29,400 g/d LPG, 25,200 g/d gasoline, 33,600 g/d kerosine-diesel. Refrigeration only. $40 MM. Contractors: Pemex, Condux, Bruce, Upaca. Completion: 1990.

Camisea-Cuzco. 1,000 MMcfd plant. 600,000 g/d LPG, 400,000 g/d gasoline, 700,000 g/d naphtha. $1,300. MM. Completion: 1993.

QATAR

NATIONAL OIL DISTRIBUTION. Umm-Said. 10,000 b/d fractionation of heavy condensate (from North Gas field) in engineering stage.

QATAR GENERAL PETROLEUM CORP. North Field development project. Arabian Gulf. 800 MMcfd plant. Refrigeration method. Products: propane, butane, natural gasoline, light naphtha, and heavy naphtha. Completion: Nov. 1990.

10 trillion cfd gas plant in engineering stage. Phase I. Contractor: Bechtel. Completion: 1991.

SAUDI ARABIA

ARABIAN AMERICAN OIL. Safaniya. GOSP-4 complex: 100 Mscfd, 250,000 b/d in preliminary design. Lummus Crest.

ARAMCO SERVICES CO. Uthmaniyah. 660,000 b/d revamp of their Gas/Oil Separation facilities in the engineering stage. Engr: Parsons. Completion: 1992.

SYRIA

AL-FURAT PETROLEUM CO. Tayyim field, ne Syria. (Syrian Petrolum 50%). 30 MMcfd associated gas treatment plant. $30 MM. Contractor: Propak Systems-Canada.

SWEDEN

SHELL RAFF. AB. Gothenburg. 170 t/d LPG, 70 t/d pentanes+. Contractor: Linde.

SWITZERLAND

RAFFINERIE DE CRESSIER. Neuchatel. 25 t/d SCOT in the engineering stage. Engr: Comprimo. Completion: 1990.

THAILAND

PETROLEUM AUTHORITY OF THAILAND. (25% PTT, 75% Thai Shell Exploration-Production). **Sirikit field, Kamphaeng Phet.** 40 MMcfd plant. 35,000 t/y LPG, 700 b/d condensate. Contractor: Randall Process Systems (U.S.). Completion: 1990.

Map Ta Pud. New gas processing/marine terminal in the engineering stage. Engr: Fish. Completion: 1990.

Rayong Province. 200 MMcfd (gas from Unocal Thailand fields). 234,900 mt/y LPG, 47,000 mt/y natural gasoline under construction. $78 MM. Consult: Linde AG. Contractors: Toyo Menka, Fish-U.S. NKK on ethane, propane, butane units. Completion: April 1990.

TRINIDAD

NATIONAL GAS CO. OF TRINIDAD & TOBAGO LTD. Phoenix Park, Trinidad. (joint venture with Conoco) $45-55 MM plant. Yield: 8,000 b/d propane, isobutane, and normal butane; 3,000 b/d natural gasoline. Eng/con: Pan West. Proposed.

UNITED KINGDOM

BRITISH GAS COMPANY. Easington, Humberside. 330 MMscfd expansion of gas receiving dew point methanol recovery condensate system under construction. Contractor: Parsons. Completion: 1990.

B.P. PETROLEUM DEVELOPMENT LTD.. Dimundton, Humberside. 450 MMscfd expansion of gas receiving dew point condensate unit under construction. Contractor: Parsons. Completion: 1990.

U.S.S.R.

MACHINOIMPORT. Tenguiz II. Natural gas and oil treatment plant including 2 Claus plants under construction. Contractors: Lurgi/Partec Lavalin. Completion: 1990

Tenguiz III. Natural gas and oil treatment plant including 2 Claus plants under construction. Contractors: Lurgi/Partec Lavalin. Completion: late 1991.

SOVIET MINISTRY OF OIL REFINING AND PETROCHEMICAL INDUSTRY. Surgut and Tobolsk. Gas processing plants. $10 billion. Feasibility study: Combustion Engineering, McDermott International, Mitsubishi, Mitsui. Completion: late 1990s.

Related Fuels—WORLDWIDE CONSTRUCTION

*Designates projects listed for the first time in the Journal.

UNITED STATES

AMCOAL (MW Kellogg and Bechtel Development). Quemahoning Indus. Park, Johnstown, Somerset County, Pa. Coal gasification plant processing 485 t/d high sulfur coal. When completed the plant will generate 60 mg electricity. Completion: 1991.

ARCO OIL & GAS. Placerita. 49 M. Watts Co-Generation. 1990.

OHIO ONTARIO CLEAN FUELS INC. Warren, Ohio. 12,280 b/d coal to liquid fuel (using catalytic process to liquefy crushed and ground coal). Design: HRI. Eng: Stone & Webster. $225 MM. Completion: 1995.

***OLD DOMINION ELECTRIC COOPERATIVE. Richmond, Va.** 393,000 kw pulverized coal fired power plant. Contractors: Westinghouse, Combustion Engineering, H.B. Zachry, Black & Veatch. Completion: 1993.

TENNESSEE EASTMAN. Kingsport. Coal gasification expansion in engineering stage. Contractor: Bechtel. Completion: 1991.

10 MMSCFD acid gas removal & cryogenic separation expansion in the engineering stage. Process Design: Linde. Completion: 1991.

UTAH MUNICIPAL POWER AGENCY. Cove Fort, Utah. 7.4 MWe Geothermal Plant in the engineering stage. $10 MM. Engr: Ben Holt. Completion: Sept. 1990.

BRAZIL

PETROBRÁS. SÁO MATEUS DO SUL, PR. 2,500 b/cd shale oil extraction. Petrosix process. Staff. Completion: 1990.

CANADA

***BP CANADA and PETRO-CANADA. Wolf Lake, Alta.** 15,000 b/d bitumen expansion from tar sands. Completion: 1990-91.

ESSO RESOURCES CANADA LTD. (OSLO project). Fort McMurray, Alta. (Consortium members: Esso (25%); Canadian Occidental Petroleum Ltd. (20%); Gulf Canada Resources Ltd. (20%); Petro-Canada (15%); PanCanadian Petroleum Ltd. (10%); and Alberta Oil Sands Equity (10%). 77,000 b/d from oil sands. Basic engineering and site preparation studies proceeding. $3.5 billion. Construction to begin in 1991. Completion: 1996.

HUSKY OIL OPERATIONS LTD. Lloydminster, Sask. 46,000 b/d heavy oil upgrader under construction. $1.2 billion. Hydrocracker (HRI); delayed coker and hydrogen plant (FW/SNC); primary upgrader plant (PCL/Braun/Simons); sulfur recovery (Monenco); crude plant and secondary upgrader (Bantrel). Completion: 1992.

***SUNCOR. Fort McMurray.** 75,000 b/d expansion (125,000 b/d total cap.) from oil sands. $2 billion. Seeking investors.

18,000 b/d crude expansion from oil sands (71,000 b/d total capacity). $50 MM. Completion: 1991.

CHINA

SHOUGANG. Beijing. 1,000 t/d coal gasification plant in engineering stage. Con: CTIP. Completion: 1991.

NETHERLANDS

DEMKOLEC. Buggenum. 250 MWE Power-from-Coal-gas demo project in the planning stage. Design: Comprimo. Completion: 1993.

TANZANIA.

TANZANIA PETROLEUM DEVELOPMENT CORP. Dar-Es-Salaam. 30,000 t/y bitumen plant under construction. Contractor: Snamprogetti. Completion: 1990.

United Kingdom

BRITISH GAS PLC. Westfield, Scotland. New Coal Briquetting plant under construction. Contractor: Babcock.

ZAMBIA

***NITROGEN CHEMICALS OF ZAMBIA. Kafue.** 300 mt revamp. Coal gasification for ammonia, under construction. Contractor: Krupp Koppers/Klockner. Completion: 1990.

Pipelining—WORLDWIDE CONSTRUCTION

*Designates projects listed for the first time in the Journal.

U.S. CRUDE LINES

ALL AMERICAN PIPELINE. 525 miles, 30-in. from McCamey to Webster, Tex. Contractor: RB Potashnick (301 miles). Completion: 1990.

AMOCO PIPELINE CO. replacement of a 6-in. pipeline near Craig, Colo.

ARCO ALASKA, INC. 13 miles, 60-in. loop of existing gas gathering for Prudhoe Bay field (EOA). Design: C.F. Braun, Inc. 1990.

PERMIAN OPERATING LTD. PARTNERSHIP. 13 miles, 6-in. from Dolphin field, Divide County, N.D., southeast to an Amoco pipeline in Burke County, N.D.

SOUTHERN CALIFORNIA PIPELINE SYSTEM. (Chevron Pipeline (project manager), Four Corners Pipeline, Shell, Texaco).

Los Padres Pipeline: 124 miles, 30-in. from Gaviota, Santa Barbara County, Calif. to Emidio, Kern County, Calif. $350 MM. Proposed.

Angeles Pipeline: 130 miles, 30-in. from Emidio, Kern County, Calif. to Los Angeles Basin refineries. $250 MM. Planned. Completion: mid 1992.

***WEST TEXAS PIPELINE.** Conoco Pipe Line Co. will construct the 180 mile, 6-in. line from its Southlake terminal near Dallas to Abilene, Tex. Completion: late 1990.

U.S. PRODUCT LINES

EXPLORER PIPELINE. 28-in. mainline expansion from Gulf Coast to Dallas-Fort Worth area under study.

PHILLIPS PIPELINE. 15 miles, 10-in. ethylene line from Clemens, Tex., to Anchor, Tex. Completion: June 1990.

15 miles, 10-in. LPG line from Clemens, Tex., to Sweeny, Tex. Completion: June 1990.

15 miles, 8-in. ethylene line from Clemens, Tex., to Sweeny, Tex. Completion: June 1990.

30 miles, 6-in. DAC line from Freeport, Tex., to Sweeny, Tex. Completion: Aug. 1990.

U.S. GAS LINES

AMERICAN PIPELINE. 38 miles, 16 in. in East Texas to connect Union Pacific Resources Carthage gas processing plant with pipelines to the West.

ANR PIPELINE. 92.4 miles, 24-in. from Muncie, Ind., to Lebanon, Ohio. $44 MM. Before FERC.

94 miles, 30-in. loop of existing lines. Before FERC.

67 miles, 24-in. in Wisconsin and Indiana. Proposed.

379 miles, 30-in. from Defiance, Ohio to Leidy, Penn. (Erie line). Before FERC.

CHAMPLAIN PIPELINE CO. 253 mile line from Highgate, Vt., to Medway, Mass. $354 MM. Planned.

COASTAL CORP. (joint venture with Arkla Inc.) 200 mile, 30-in. line from Latimer County, Okla., to Sherrill, Ark. $120 MM. Completion: mid 1990.

(joint venture with Union Enterprises Ltd.) 155 mile line from Niagara Falls to Syracuse, NY. Completion: late 1990 or early 1991.

COLUMBIA GAS TRANSMISSION CORP. 8.4 miles of 24-in. in Bedford and Fulton counties, Pa. Nov. 1990.

3.7 miles of 24-in. in Adams county, PA. Nov. 1990.

7.7 miles and 8.9 miles of 36-in. in Randoph county, W.VA. Nov. 1990.

11.2 miles of 26-in. in Braxton, Webster, Lewis and Upshur counties, W.Va. Nov. 1990.

3.1 miles of 36-in. in Warren county, Va.

8.5 miles of 36-in. in Kanawha and Clay counties, W.Va. Nov. 1990.

7.3 miles of 24-in. in Lancaster county, Pa. Planned. 1991.

7.2 miles of 24-in. in Fayette and Greene countes, Pa. Planned. 1991.

CMS GAS TRANSMISSION CO. (CMS Energy Corp.) 87.5 mile, 8⅝-16in. from Ogemaw County's West Branch Township, Mich., south to Midland, Mich., and east to Akron Township, Tuscola County, Mich. Proposed.

CONOCO PIPE LINE CO. 180 miles, 6-in. line from their Southlake terminal near Dallas to Abilene, Tex. Completion: late 1990.

***DELTA PIPELINE CO.** 190 miles, 24-in. from Wilburton in Latimer Co., Okla., eastward through Arkoma basin in Arkansas. $82 MM. Completion: June 1990. Before FERC.

EASTERN AMERICAN STATES TRANSMISSION. (Coastal Corp.). 285 miles, 30-in. from Ohio to Pennsylvania and 76 miles, 24-in. from New York to Long Island. Before FERC.

***EL PASO NATURAL GAS.** 14.8 miles, 30-in. loop line from Mohave Companion Project to Arizona. $10.8 MM. Before FERC.

26 miles, 30-34 in. loop lines in Colorado and New Mexico. $23 MM. Before FERC. Completion: mid 1990.

EMPIRE STATE PIPELINE. (Coastal Corp., Houston, and Union Enterprises Ltd., Toronto). 155 miles, from Niagara Falls to Syracuse to connect with Union Gas Ltd.'s Canadian system. $82.5 MM. Proposed. Completion: late 1990 or early 1991.

ENRON CORP. 191.2 miles, 4-20-in. from Louisiana to South Florida. Pending FERC.

30 miles, 24-in. north of Janesville, Wisc. to sw corner of Waukesha County. Pending Wisconsin PUC.

filed with FERC for an expansion of it's eastern leg from Ogden, Iowa to near Janesville, Wis. Expected completion: 1990-92.

GATEWAY PIPELINE CO. (United Gas Pipe Line). 25 miles, 30-in. line to connect existing and planned gas treatment plants in Mobile County, Ala., to United's Lirette, La., to Mobile, Ala., line. Before FERC.

IROQUOIS GAS TRANSMISSION SYSTEM. 250 miles, 30-in. from Iroquois, Ont., to Wright, N.Y., and 120 miles, 24-in. from Wright to South Commack, N.Y. (Long Island) $524.7 MM. Completion: 1990.

JUBILEE PIPELINE. (Enron Corp. and others) 81.6 miles, Mobile Bay off Alabama, before FERC. Completion: Jan. 1990.

KERN RIVER GAS TRANSMISSION. (Williams Cos. and Tenneco). 762 miles, 36-in. from Kemmerer, Wyo. to Bakersfield, Calif. $800 MM. FERC final certificate issued.

MEXUS INTERSTATE PIPELINE INC. (Intercon Gas Inc.) 1,625 miles along the U.S.-Mexico border from Reynosa, Tamaulipas, to Tijuana, Baja Calif. 30 miles, 30-in. laterals to U.S. border.

340 miles, 30-in. to Pecos, Webb, and Hildalgo Counties, Tex. $303 MM. Completion: early 1990s.

MICHIGAN CONSOLIDATED GAS. 25.2 miles, 10¾-in. and 6.8 miles, 6⅝-in. mainline extension from Forest township, Cheboygan County to Pulawski township, Presque Isle County, Mich.

MISSOURI PIPELINE CO. 22 miles of 12 - 16-in. gas pipeline from Curryville, Mo. to St. Charles and West Alton, Mo. $15 MM.

MOJAVE PIPELINE. (Enron Corp. and El Paso Natural Gas). 383 miles, from San Ardo, Calif. to Needles station near Topock, Ariz. (Lateral to Kern County, Calif.). $250 MM. Proposed.

NATURAL GAS PIPELINE CO. OF AMERICA. 97 miles, 30-in. from southern Oklahoma to NGPL Amarillo, Tex. extension. Before FERC.

94 miles, 30-in. northeast Texas connecting East Texas to Gulf coast main line. Before FERC. Total cost: $108 MM.

NEW JERSEY NATURAL GAS. 33 miles, 30-24-and 20-in. from Ocean County, N.J., to Monmonth County, N.J. Eng: Ford, Bacon & Davis. Planned. Completion: Sept. 1990.

NIAGARA MOHAWK POWER CORP. (Trans York system) 27 miles, 16-in. from Watertown, N.Y., to Saw Mill Bay, Clayton, N.Y. $25 MM. Completion: Nov. 1990.

NORTH CAROLINA NATURAL GAS. 13 miles, 10-in. in Johnston County, N.C. Acquiring right-of-way. Contractors: Hillman Ray & Assoc. Completion: June 1990.

NORTHERN BORDER PIPELINE. 396 miles, 36-in. mainline extension from Ventura, Iowa, to Chrisman, Ill. Before FERC. $374 MM.

PACIFIC GAS TRANSMISSION. 104 miles, 42-in. and 326 miles, 36-in. from Kingsgate, B.C., to Malin, Ore. $945 MM. Before FERC. Completion: 1993.

RAZORBACK PIPELINE CO. 70 miles, 8-in. line from Mount Vernon, Missouri to Rogers, Arkansas. Completion: Oct. 1989. (partnership of COZ Pipeline Co. and Conoco Pipe Line Co.).

SAGINAW BAY PIPELINE. (Michigan Consolidated Gas) 125 miles, 10-20 in. from Ogemaw County, Mich., to Tuscola County, Mich. $65 MM. Completion: 1990.

SEAGULL ENERGY CORP. 42 miles, 24-in. from Oyster Lake Station to Old Ocean, Tex. Pending.

SONAT EXPLORATION CO. 14 miles, 12-in.

pipeline in Panola County, Tex. Completion: Aug. 1 (joint venture with Venture Resources Inc.).

TENNECO INC. AND CITRUS CORP. (joint venture) 53 miles, 36-in. line from Mobile Bay off Alabama north to an interconnection with Florida Gas Transmission Co. Before FERC.

***TENNESSEE GAS PIPELINE.** 48.7 miles, 30-in. line between the Niagara River at Lewiston, N.Y., and East Aurora, N.Y. Completion: Nov. 1990.

67.1 miles of loop and laterals on Tennessee's existing system. $100 MM. Completion: 1990.

***TENNESSEE RIVER INTRASTATE CO.** (with Champion International Corp.) 38 mile line to Courtland, Ala.

TEXAS EASTERN TRANSMISSION (joint venture with ANR Pipeline) 204 miles, 30-in. line from existing and proposed gas processing plants in Mobile County, Ala., northwest to Texas Eastern's main line in Kosciusko, Miss. $153.3 MM. Before FERC.

(Texas Eastern only) 55 mile, 24-in. offshore line from Mobile County, Ala. and future offshore production facilities in the Norphlet trend southwest to a proposed Viosca Knoll extension of the company's Main Pass pipeline system. $72.5 MM.

UNITED GAS PIPLINE. 25 miles, 30-in. gas line from Gateway Pipeline to Mobile Co. pending FERC. Completion: ASAP.

21.2 miles, 24-in. gas line from Marchand Jct. to Lutcher, La. (project on hold). Completion: June 1990.

13.4 miles, 24-in. gas line from LaPlace, La. to St. Rose, La. (project on hold). Completion: June 1990.

3 miles, 8-in. gas line from Hattiesburg, Ms. Contractor: South Central Construction Co. Completion: Sept. 1998.

VIRGINIA NATURAL GAS. 80 miles, 24-in., 40 miles, 10-in. from Richmond, Va. to James City County, Va. Completion: 1991.

WYCAL-Wyoming-California Pipeline Co. (Coastal Corp.). 1,000 miles, 24-36-in. from Rocky Mountain Overthrust Belt, sw Wyoming to near Bakersfield, Calif. FERC final certificate issued. $665 MM. Completion: 1991.

YUKON PACIFIC CORP. 820 miles from Prudhoe Bay to Kenai Peninsula. Proposed.

ABU DHABI

ABU DHABI NATIONAL OIL. 93 miles, 28-in. Maqta-Al-Ain gas line. Completion: Dec. 1990.

ALGERIA

300 mile gas line from Hassi R'Mel gas field in Algeria to the Moroccan border. Proposed. Completion: 1995.

AUSTRALIA

QUEENSLAND GOVERNMENT. 317 mile line from a gas field at Roma to the port of Gladstone. $38 MM (Australian). Contractor: Saipem Australia. Completion: Oct. 1989.

330 miles, 12.2-in. gas line to connect Surat basin and Denison Trough gas fields, southeast Queensland. Bids out. $100 MM.

BANGLADESH

BANGLADESH OIL, GAS, AND MINERALS CORP. 117 miles, 20-in. gas line from Kailashtila to Ashanganj. Design stage. Consulting: Pencol. Completion: 1991.

BELGIUM

DISTRIGAZ.

Gas lines planned:

1.5 miles, 10-in. from Huy to Wanze. Completion: Dec. 1990.

22 miles, 24-in. from De Lo to Ronquieres. Completion: Dec. 1990.

91 miles of undetermined length from Zeebrugge to Blaregnies. Completion: 1992-1993.

BOLIVIA

YPFB.

346 miles gas line from Santa Cruz to the Brazilian border. Planned.

CANADA

***POUCE COUPE PIPE LINE LTD.** 16 miles of crude line connecting facilities built by Norcen Energy and Canadian Hunter in Northeast B.C. with Peace Pipe system in nw Alberta.

GAS LINES

ALTAMONT PROJECT. (Amoco Canada Ltd., Canadian Occidental Petroleum Ltd., Esso Resources Canada Ltd., Home Oil Ltd., Mobil Oil Canada Ltd, Petro-Canada, and Shell Canada Ltd.) $1 billion line from Alberta to California. Proposed.

CANADIAN WESTERN NATURAL GAS. 13 miles, 12-in. from Shell jumping pound plant to Banff. Completion: Fall 1990.

***FOOTHILLS PIPELINES (YUKON) LTD.** 1,429 miles of gas line from the Arctic Coast near Inuvik, N.W.T., to Caroline in Central Alberta to connect with existing North American pipeline systems. $4.4 billion. Before NEB. Completion: 1996.

$550 MM expansion involving the eastern leg of its prebuild system and the connecting Northern Border system in the U.S. Completion: Nov. 1990.

NOVA CORP. OF ALBERTA. 18 miles of 24-in. and 10 miles of 20-in. laterals in the Grande Prairie/Beaver lodge area of Alberta.

PACIFIC COAST ENERGY CORP. (joint venture of Westcoast Energy and Chieftain Development) 330 miles, 10-in line from British Columbia to Vancouver Island. $500 MM. Proposed. Contractor: TBA. Completion: Sept, 1990.

PETROLEUM RESOURCES LTD. 21 miles, sour gas pipeline near Calgary. $14 million. Approval received. **POLAR GAS LIMITED.** 1,318 miles, 36-in. from Canadian Mackenzie Delta/Beaufort Sea to Edson, Alberta. Filed with NEB. Completion: Nov. 1996.

SABLE GAS SYSTEMS (TransCanada Pipelines, Nova Scotia Resources). 490 miles, 26-in. from Sable Island through Nova Scotia and New Brunswick to Maine Border. Proposed.

TRANSCANADA PIPELINES LTD. 293 miles of line expansion. $652 MM. Completion: 1990.

*128 miles, 36-in. loop to link facilities near Sarnia, Ont., with eastern portion of its system near Hamilton. Proposed.

*5 loops totaling 41 miles, 42-in. from Ignace to Nipigon, Ont. Contractor: Banister Pipelines Ltd.

CHILE

SOCIEDAD NACIONAL de OLEODUCTOS LTD. 11 miles, 4-in. jet fuel line from Maipú, Chile to Pudahuel, Chile. Under study.

CHINA

***CHINA NATIONAL OIL CORP.** 180 mile, 426 mm crude line from Zhongyuan oil field to Luoyang, Henan, refinery.

620 miles, 24-in. gas line from Yacheng field, Hainan Island to Guangdon Province, Guangzhou, south to Hong Kong. Feasibility study: Fluor Daniel PRC Ltd.

Qiong Zhou Strait crossing (Yacheng, Hainan, Hong Kong gas line). Joint study by: China National Offshore Oil Corp. and J.P. Kenny, London.

155 mile crude line from Shengli field to Huangdao, Shandong province. Eng-construction: Novacorp International.

230 mile gas line from Zhongyaun, Henan Province to Cangzhou, Hebei Province. Contractor: Novacorp International.

CHINA, TAIWAN

CHINESE PETROLEUM CORP.

GAS LINES:

9 miles, 30-in. from Yungan LNG receiving terminal to Kangshan under construction. Contractor: BES. Completion: Dec. 1990.

176 miles, 26-in. from Kangshan to Hsinchu under construction. Contractor: BES. Completion: Dec. 1990.

33 miles, 24-in. from Kangshan to Kao hsiung Linhai Industrial Zone under construction. Contractor: BES. Completion: Dec. 1990.

COLOMBIA

ECOPETROL.

12 miles, 6-in. from Variante Rio Paila under construction. Completion: Feb. 1990.

CRUDE LINES PLANNED:

297 miles, 24-in. from Vasconia to Covenas (Oleoducto Colombia). Completion: Dec. 1990.

37 miles, 10-in. from El Toldado to Gualanday. Completion: June 1990.

9.5 miles, 20-in. from Galan to Vizcaina. Completion: Dec. 1990.

PRODUCTS LINES PLANNED:

18 miles, 6-in. from Medellin to Rionegro.

81 miles, 6-in. from Facatativa to Villavicencio.

20 miles, 12-in. from Sebastopol to Medellin.

47 miles, 6-in. from Neiva to Natagaima. Completion: June 1990.

8 miles, 8-in. from Tulua to Tulua. Completion: Dec. 1990.

11 miles, 12-in. from Girardota to Bello. Completion: June 1990.

82 miles, 14-in. from Pozos Colorados to Ayacucho. Completion: Dec. 1990.

17 miles, 8-in. from Guacari to Yumbo.

GAS LINE PLANNED:

58 miles, 20-in. from Dibulla to Ballenas.

HOCOL-ELF AQUITAINE - ESSO. 37 miles, 12-in. and 214 miles, 20-in. crude line from Yaguara to Vasconia under construction. Contr: Willbros. Completion: May 1990.

PROMIGAS S.A. 373 miles, 20-in. and 2459 miles, 24-in. gas line from Pajaro to Bogota under study.

7 miles, 4-in. gas line from Main Gas Pipe Line to Montelibano planned.

1.43 miles, 2-in. gas line from Main Gas Pipe Line to Chinu planned.

4.8 miles, 2-in. gas line from Main Gas Pipe Line to San Onofre planned.

2.2 miles, 3-in. gas line from Main Gas Pipe Line to Sampues planned.

9.3 miles, 3-in. gas line from Main Gas Pipe Line to Corozal planned.

12.4 miles, 4-in. gas line from Main Gas Pipe Line to Arjona planned.

8.7 miles, 4-in. gas line from Barranquilla to Puerto Colombia planned.

5.4 miles, 3-in. gas line from Main Gas Pipe Line to Galapa planned.

PIPELINING

CUBA

116 mile crude line linking the terminal at Matanzas on the northern coast east of Havana with a refinery at Cienfuegos on the southern coast (with Soviet assistance).

DENMARK

***DANSK OLIE OG NATURGAS.** 7 miles, 12-in. gas line from Lynge to Hillerod. Under study. Completion: 1991.

*14 miles, 12-in. gas line from Skjddelev to Aihus. Under study.

EQUADOR

EMAP. Quito. 36-in. water line and pumping station under construction. Engr: Techint. June 1990.

FINLAND

NESTE OY. 26 mile extension of Nesty Oy's southern Finland gas line into greater Helsinki. Contractor: E. M. Pekkinen Oy. Welding and fitting: Zarubezhjneftegasstroi (U.S.S.R.). $10 MM.

FRANCE

GAZ DE FRANCE. (joint venture with Gas du Sudouest and Enagas) 44 miles, 24-in. gas line from Serrablo, Spain to Lacq, France. Completion: 1991.

STE. DU PIPELINE MEDITERANEE-RHONE. 94 miles, products line from La Mede (Bouches-du-Rhone) to Puget-sur-Argens (Var). Eng. study: OTP.

GERMANY

ERDGAS-Verkaufs. 70 miles, 16-in. gas line from Rehden to Frenswegen planned.

GASVERSORGUNG SUDDEUTSCHLAND. 37 miles, 28-in. gas line from Amerdingen to Scharenstetten planned. Completion: Oct. 1990.

HUNGARY

HUNGARIAN OIL AND GAS TRUST. 22 miles, 31-in. gas line from Pilisvörösvár to Dorog planned. Contractor: Olajterv, Kóolajvezetek Épitó Vállalat. Completion: 1990.

INDIA

*$600 MM crude and gas lines from Bombay High field to Hazira. Proposed.

OIL AND NATURAL GAS COMMISSION. 15 miles, 24-in. products line for Hazira export terminal. Contractor: Land & Marine (India) Ltd. Planned. Completion: 1990.

OIL INDIA LTD. (Indian Oil Corp.) 826 mile petroleum products line from Kandla, Gujarat, to Bhantinda, Punjab. $240 MM. Completion: 1992.

IRAN

IGAT 2. 880 miles, 48-56 in. from Kangan gas field on the Persian Gulf to the Soviet Union. Contractor: Saipem (will lay 20% of remaining pipeline).

ITALY

241.8 miles, 12 in.-20 in.-34 in. crude pipeline from Ras Laffan to Umm Said. Contractor: QGPC-Quatar. Completion: Nov. 1990.

SNAM SpA. 14 miles, 20-in. gas loop from Monfalcone to Villa Opicina. Planned.

115 miles, 42-in. gasline from Malborghetto to Camisano Vicentino (USSR-Italy natural gas pipeline expansion) under construction. Contractor: Snamprogetti. Completion: June 1990.

KENYA

KENYA PIPELINES CO. LTD. 355 miles, 6-8-in. products line from Nairobi to western Kenya (extension of existing Mombasa to Nairobi pipeline) in conceptual design stage. Consulting: Pencol. Completion: 1991.

KOREA

68 miles, 20-24-in. gas line. Part of a $130 MM project for a gas feeder pipeline system to join a pipeline from LNG facilities at Pyeong Taek to Inchon.

MALAYSIA

PETRONAS. 485 miles, 36-in. gas line from Kerteh on Malaysia's northeast coast to Singapore with branch lines to Kuala Lumpur and other large Malaysian cities. Total cost: $310 MM. $160 MM construction contract: MMC Gas. $150 MM for pipe which will be provided by Petronas. Completion: Nov. 1991.

375 miles, 24-36-in. crude line. Planned.

MEXICO

PEMEX.

CRUDE LINES

39 miles, 16-in. from Imuris to Canonea. Contractor: Spie Capag.

PRODUCTS LINES

37.3 miles, 24-in. from Venta de Carpio, Edo. de Mexico to Tulsa, Hgo. Under construction.

GAS LINES

155 miles, 24-in. from Jaltipan, Ver. to Salina Cruz, Oax. Planned.

18.6 miles, 16-in. from Matapionche, Ver. to Angostura, Ver. Engineering stage.

12.4 miles, 14-in. from Angostura, Ver. to Tierra Blanca, Ver. Engineering stage.

26.7 miles, 20-in. from Matapionche, Ver. to Paso del Toro, Ver. Engineering stage.

236.2 miles, 48-in. from Veracruz, Ver. to Santa Ana, Hgo. Under construction.

MOROCCO

900 miles of gas line through Morocco to Tangier to a link across the Strait of Gilbralter to Spain. Proposed. Completion: 1995.

NETHERLANDS

NV NEDERLANDSE GASUNIE. 19 miles, 8-in. gas line from Monster/Gaag to Kemma (Botlek) in engineering stage. Completion: Oct. 1990.

NIGERIA

AGIP ENERGY & NATURAL RESOURCES and NNPC. 12-in. line from Aghbara offshore field to Brass terminal, Rivers State.

NIGERIAN NATIONAL PETROLEUM CORP. 234 miles, 16-in. and 75 miles, 12-in. products lines from Port Harcourt, Enugu, Auchi to Benin City, Nigeria. Design stage. Completion: 1990.

52 km, 16-in. clean product pipeline from Bonny crude oil terminal to Port Harcourt refinery. Contractor: Japan gasoline corp. of Japan. Completion: dec. 1990.

52 km, 16-in. lagged fuel oil pipeline from Bonny crude oil terminal to Port Harcourt refinery. Contractor: JGC corp. of Japan. Completion: Dec. 1990.

SHELL PETROLEUM DEVELOPMENT. 19 miles, 10-in. crude line from Ogini to Eriemu. Planned. Completion: Dec. 1989.

4 miles, 20-in. gas line from Cawthorne Channel II flowstation to Cawthorne Channel I flowstation. Planned. Completion: Jan. 1991.

2 miles, 8-in. crude line from Elelenwa flowstation to Nkpoku-Bomu Pipeline. Planned. Completion: Dec. 1991.

27 miles, 24-in. crude line from Nkpoku to Bomu. Planned. Completion: Dec. 1990.

8 miles, 12-in. gas line from Cawthorne I flowstation to Alakiri gas plant. Planned. Completion: Jan. 1991.

14 miles, 12-in. gas line from Alakiri to Bomu. Planned. Completion: Jan. 1991.

2 miles, 8-in. crude line from Ubie flowstation to Trans Niger Pipeline (Rumuekpe-Adibawa section). Planned. Completion: Dec. 1991.

7 miles, 8-in. crude line from Belema flowstation to Nembe Creek Cawthorne Channel trunkline. Planned. Completion: Dec. 1992.

43 miles, 20-24 in. crude line from Opukushi to Forcados terminal (Trans Ramos Pipeline). Planned. Completion: Dec. 1993.

3 miles, 8-in. crude line from Angalalei flowstation to South Forcados Pipeline at Isampou Manifold. Planned. Completion: Dec. 1993.

6 miles, 8-in. crude line from Okpokonou flowstation to Southern Forcados Pipeline at Ogara Manifold. Planned. Completion: Dec. 1993.

6 miles, 8-in. crude line from Kanbo flowstation to Trans Ramos Pipeline at Kanbo Manifold. Planned. Completion: Dec. 1993.

3 miles, 8-in. crude line from Ogbotobo flowstation to Trans Ramos Pipeline at Ogbotobo Manifold. Planned. Completion: Dec. 1993.

NORWAY

STATOIL. 25 miles, 36-in. gas line from Zeepipe Sleipner to Statpipe. Eng: Snamprogetti. Planned. Completion: 1993.

524 miles, 30-40-in. gas line from Zeepipe Sleipner, Norway to Zeebruge, Belgium. (Zeepipe Natural Gas Transportation System - Phase 1) Eng: Snamprogetti. Completion: late 1993.

80 miles, 36-in. gas line from Zeepipe Troll to Heimdal. Planned. Completion: 1996.

95 miles, 40-in. gas line from Zeepipe Troll to Sleipner. Planned. Completion: 1996.

150 miles, 20-in. gas pipeline from Sleipner to Karsto. Planned. Completion: 1993.

PAKISTAN

SUI SOUTHERN GAS CO. LTD. 182 miles, 20-in. gas loops from Sui to Karachi. Contruction in progress. Completion: Dec. 1990.

PERU

PETROLEOS DEL PERU. 364 miles, 26-in.; 300 miles, 10-in.; 64 miles, 8-in. gas lines from Camisea-Cuzco to Callao-Lima. Bidding. Completion: mid 1993.

52 miles, 6-in. and 52 miles, 4-in. gas lines from Aguaytia-Ucayali to Pucallpa-Ucayali. Contractors: Pemex, Condux, Bruce, Upaca. Completion: mid 1990.

30 miles, 3-in products line from Aguaytia-Ucayali to Campo Verde-Ucayali. Contractors: Pemex, Condux, Bruce, Upaca. Completion: mid 1990.

Pipeline being layed in United Kingdom.

PIPELINING

QATAR

***QATAR GENERAL PETROLEUM CORP.** 241 miles, 12-20-34-in. crude line from Ras Laffan to Umm Said under construction. Contractor: Saipem. Completion: Nov. 1990.

262 miles of 12-20-34-in. gas line for North Field Development Project under construction: Contractors: Saipem/Snamprogetti. Completion: Aug. 1990.

SPAIN

CAMPSA. 134 miles, 12-8-in. products line from Tarragona to Barcelona-Gerona in engineering stage. Contractor: Heymo. Completion: 1990.

***CIA. ARRENDATARIA DEL MONOPOLIO DE PETROLEOS SA.** 69 miles, 8-in. products line from Valladolid to Salamanca.

ENAGAS. 145 miles, 26-in. gas line from Sevilla to Brazatortas in engineering stage. Contractor: Heymo. Completion: 1991.

44 miles, 24-in. gas line from Serrablo, Spain to Lacq, France. (joint venture with Gas de France and Gas du Sudouest). Contractor: Heymo. Completion: 1991.

SWITZERLAND

GASVERBUND OSTSCHWEIZ. 16.8 miles, 10-in. gas line from Truebbach to Chur. Contractor: Stadt Chur. Completion: 1989-90.

TANZANIA

TAZAMA PIPELINES LTD. 54 km, 8-12 in. crude line. pipeline rehabilitation, Phase 2. Contractor: Saipem. Completion: 1990.

THAILAND

PETROLEUM AUTHORITY OF THAILAND. (PTT).

*99 miles, 28-32 in. gas line from Erawan to Khanom district to Nakhon Si Thammarat Province. Feasibility study.

106 miles, 28-32 in. gas line from PTT's B structure gas field to Unocal Thailand Ltd's Erawan field. Feasibility Study.

8 miles, 28 and 16-in. laterial loop gas line from Station No. 6 to Bangpakong power plant. Completion: 1990.

300 miles, 16 and 24-in. gas line from Nam Phong Khonkan Province to Saraburi Province. Feasibility study. Completion: 1993.

18 miles, 8-in. gas spur line from Sri Racha to Laem Chabang in Chon Buri Province. $3.5 MM. Completion: 1990.

50 miles, 14-16-in. oil products line from eastern Bangkok north to Ayutthaya Province. Feasibility study.

437.5 miles, 22 or 18-in. gas line from Khonkaen Province to Chon Buri Province. Planned. Completion: 1993.

121 miles, 32-in. gas line from offshore Texas Pacific field, Gulf of Thailand to Erawan field, Gulf of Thailand. Planned. Completion: 1992.

TURKEY

BOTAS. Extension of 496-mile gas line from Ankara to Izmir. Proposed.

UNITED KINGDOM

BRITISH GAS CORP. 2.5 miles, 18-in. gas line from Hornsea to Beeford. Under study. Completion: 1990-1991.

37 miles, 36-in. gas line from Cambridge to Epping. Under study. Completion: Oct. 1990.

12.5 miles, 36-in. gas line from Steppingley to Whitwell. Under study. Completion: Oct. 1990.

15.6 miles, 36-in. from Easington to Paull. Under study. Completion: 1991.

25 miles, 8-in. product line from Easington to Killingholme. Planned. Completion: Oct. 1990.

BP PETROLEUM DEV. LTD. 56 miles, 16-in. crude line to Southampton area and 31 miles, 8-in. gas line to Sopley, Hampshire from Wytch Farm area. $28.5 MM. Contractor: Press Const.

BP and TOTAL OIL MARINE. 15 miles, 12-in. link of St. Fergus gas line to Forties system at Cruden Bay. Contractor: Norwest Holst.

BP EXPLORATION. 36-in. pipeline to serve Forties field in the U.K. North Sea. Contractor: ETPM Services (U.K.) Ltd.

CATS-Central Area Transmission System. (40% Gas Council Exploration Ltd., 30% Amoco UK Exploration, 18% Amerada Hess, 12% Texas Eastern North Sea Inc.). $1.8 billion central UK North Seas gathering system in detailed design study. Completion: 1993.

PETROFINA (U.K.) LTD. 139 mile products line from Immingham, South Humberside, to a depot at Buncefield, Hertfordshire. Contractor: John Brown.

***SHELL U.K. LTD.** 150 mile ethylene pipeline system linking the Stanlow and Carrington plants in northwestern England to Teesside on the east coast. $154 MM. Construction to start in 1991. Completion: early 1992.

SIMON STORAGE GROUP LTD. (North Thames Pipeline) 12 miles, 10-in. products line in design stage. Consulting: Pencol. Completion: 1990.

VENEZUELA

CORPOVEN SA. 373 mile products line from Puerto la Cruz refinery to Maturin, San Tome, Ciudad Bolivar, Puerto Ordaz, Puerto Ayacucho.

MARAVEN SA. Sumandes products line from San Lorenzo, Lake Maracaibo to El Vigia and Tachira (Andes). Planned. $213 MM. Completion: 1990.

ZAMBIA

TAZAMA PIPELINES LTD. 1,070 miles, 8-12-in. from Dar-Es-Salaam, Tanzania to Ndola. Design complete. On hold. Completion: 1990.

30 miles, 12-in. and 15 miles, 8-in. replacement of crude pipeline from Dar-Es-Salaam, Tanzania to Ndola, Zambia. Completion: 1990.

1068 miles, 8-in. and 480 miles, 12-in. of crude pipeline from Dar-Es-Salaam, Tanzania to Ndola, Zambia. Contractor: Inhouse. Completion: 1992.

ZIMBABWE

LONRHO PLC. 135 miles, 10-in. products line from Feruka to Harare (extension of Beira to Feruka pipeline). Study and conceptual design stage. Consulting: Pencol. Completion: 1991.

OGJ SPECIAL

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economics

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U.S. interstate pipelines strengthen in 1988

Warren R. True
Pipeline/Gas Processing Editor

Operations improved last year for U.S. regulated petroleum pipeline companies.

In almost all categories tracked by the annual Oil & Gas Journal Pipeline Economics Reports, data from annual reports filed with the U.S. Federal Energy Regulatory Commission (FERC) showed improvements or were little worse than flat when compared with 1987 data.

Most noticeable was the better than 9% increase from 1987 in net income for all (major and nonmajor) natural-gas transmission companies on operating revenues that rose for the first time since 1983 (Table 1).

Underlying this growth was a surge of more than 21% in volume of gas transported for others along

Fig. 1

Operating revenues: natural-gas pipeline companies

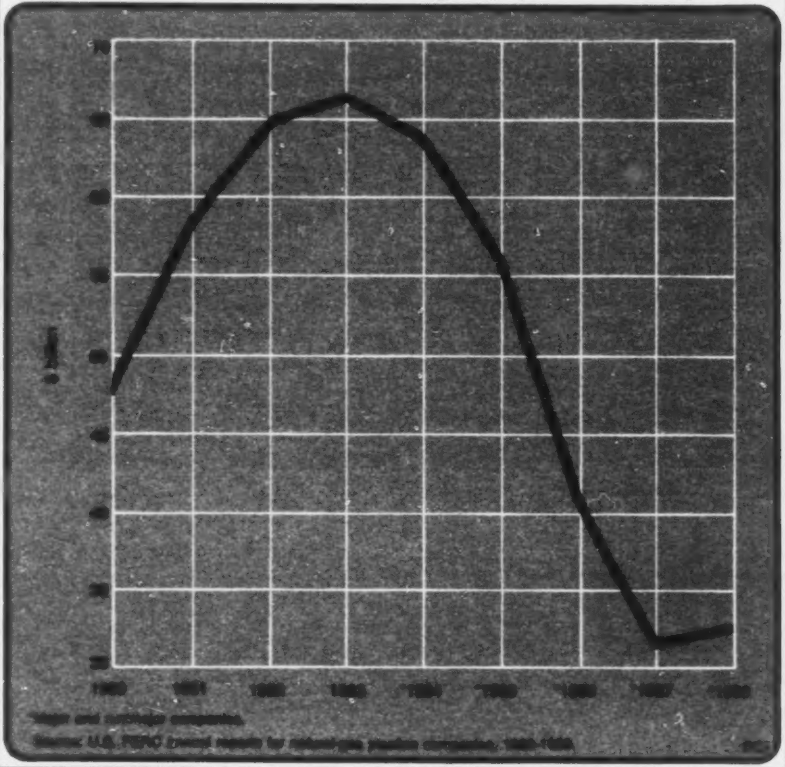


Table 1

Pipeline company revenues, incomes

	Gas		Liquids	
	Operating rev., $1,000	Net income, 1,000	Operating rev., 1,000	Net income, 1,000
1980	48,128,791	3,098,018	6,356,037	1,912,411
1981	57,792,315	3,810,566	6,678,039	2,030,667
1982	64,850,548	3,566,041	7,140,469	2,162,447
1983	66,261,738	3,565,776	7,472,286	2,352,748
1984	*64,006,035	*4,055,700	7,823,582	2,544,764
1985	*56,252,921	*5,190,817	7,460,847	2,430,845
1986	*40,664,635	*1,653,010	7,287,062	2,051,372
1987	*†31,596,171	†*1,438,203	†7,057,264	†2,475,411
1988	*32,736,380	*1,572,609	6,861,938	2,504,986

Source: U.S. FERC annual reports by regulated interstate natural-gas and liquids pipeline companies. *Major and nonmajor companies under the FERC's classification system for natural-gas pipeline companies effective beginning with the 1984 reporting year. See table GAS COMPANIES, p. 64, for definition of major and nonmajor companies. †Revised from initially published data.

with a slight increase in sales, the latter the first of this decade. This growth is reflected in the reversal in operating revenues which have been falling steeply since 1983 (Fig. 1).

Although regulated common-carrier petroleum liquids (crude oil and product) pipelines showed less growth than natural-gas companies, they nonetheless held their ground in all categories. The strongest growth was better than a 3% increase in product-pipeline trunkline traffic. Overall traffic grew at slightly less than a 3% clip.

On the construction front, U.S. projects proposed for the 12-month period ending June 30, although off from that for the previous 12-month period, was nevertheless strong with more than 2,400 miles of line proposed, 386 of which was targeted for offshore.

Bucking the trends. Data from 1988's FERC annual reports indicate that declines evident throughout this decade may be slowing, if not ending.

Net incomes for regulated major interstate natural-gas pipeline companies improved by 26.6% last year; operating revenues were up 1.45%. Net incomes for combined major and nonmajor gas-pipeline companies rose 9.35%; operating revenues were up 3.61% over 1987.

Table 2

U.S. interstate pipeline mileage

	Miles		
Year	Gas	Liquid	Total
1979	264,134	169,794	433,928
1980	274,248	172,673	446,921
1981	274,634	172,815	447,449
1982	286,999	172,549	459,548
1983	285,204	167,819	453,023
1984	*258,379	173,922	*432,301
1985	*279,395	171,401	*450,796
1986	*281,881	170,014	*451,895
1987	*280,085	167,865	*447,950
1988	*281,381	170,457	*451,838

Source: U.S. FERC Form 6 Annual Reports—oil pipelines; Forms 2 & 2A—gas pipelines.
*Reflects operating mileage as reported under the FERC's classification system for natural-gas pipeline companies effective beginning with the 1984 reporting year. Only major gas-pipeline companies are required to file mileage. See table GAS COMPANIES, p. 64, for definition of major and nonmajor companies and details of companies reporting mileage for 1987.

Operating revenues for major and nonmajor natural-gas transmission companies had been falling since 1983. Similarly, net incomes fell in 1983 and for 3 years beginning with 1985.

Petroleum liquids pipeline companies' net incomes in 1988 were up 1.2% on operating revenues that declined 2.8%. That decline is part of a trend begun in 1985. Net incomes' rise continues a rise begun in 1987.

Total pipeline mileage reported by major natural-gas companies was flat from 1987 to 1988 despite a 3.3% increase in reported transmission mileage. The same pattern held for combined major and nonmajor pipeline companies; total mileage growth was essentially flat at 0.5% despite a 2.83% increase in transmission mileage for both categories of companies.

The addition of transmission mileage nonetheless represented an increase in the nation's major gas-transmission system of almost 6,000 miles.

Liquid pipeline companies showed virtually no change (+1.5%) in total pipeline mileage utilized during 1988 compared with 1987. Reflecting greater U.S. product demand but declining crude-oil production, mileage for product pipelines showed the largest gain at 2,322 miles (+3%).

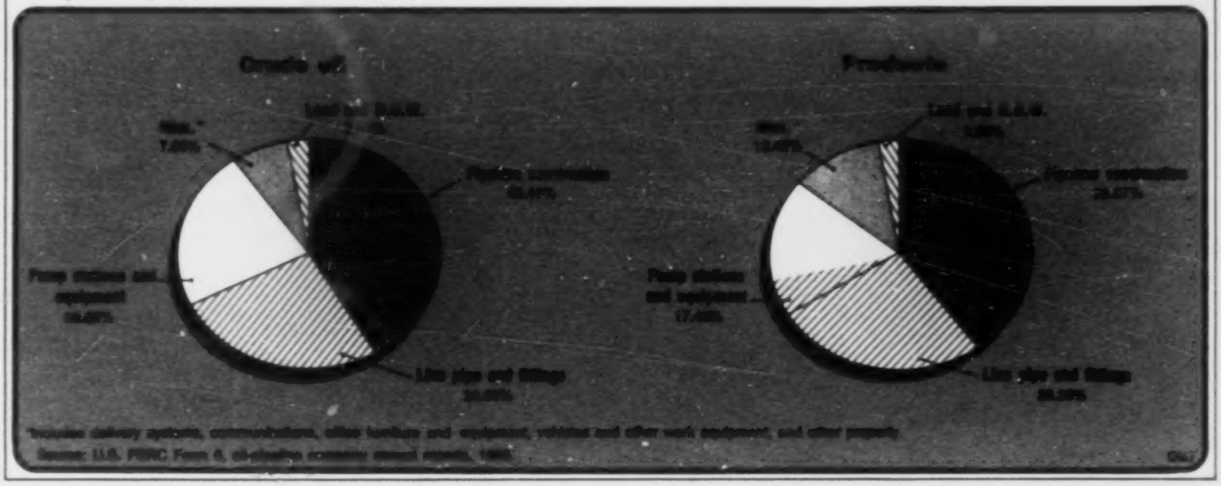
Total mileage reported for 1988 was 451,838 with 281,381 devoted to gas transmission, field, and storage, while 170,457 was for crude oil and product pipelines (Table 2).

Construction pace. For 12-month period ending June 30, 2,410.37 miles of pipeline construction were proposed to the FERC, of which 386.59 miles were planned for offshore Gulf of Mexico (Table 3).

This total mileage was proposed in 105 construction projects, 21 of

Fig. 2

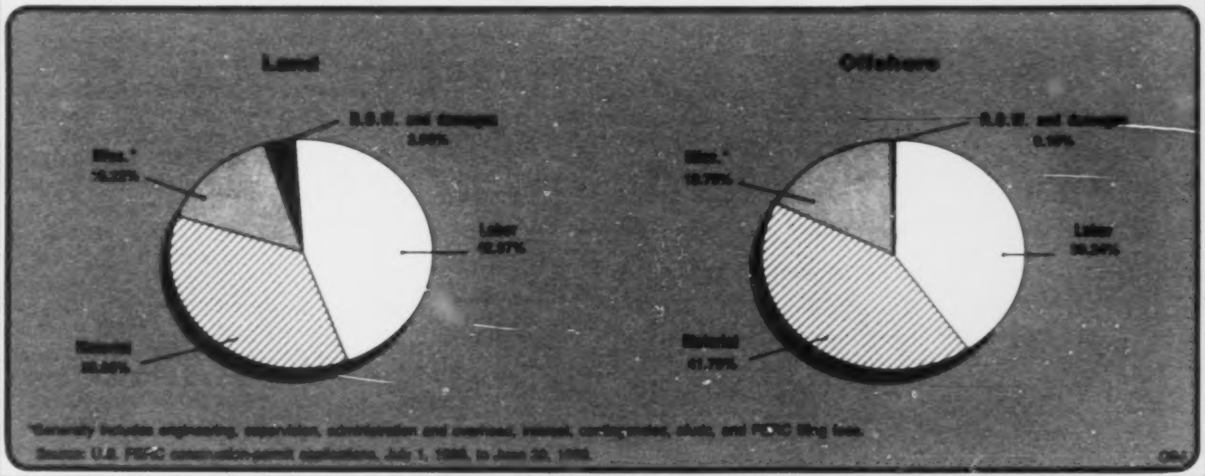
Liquids-pipeline investment



*Includes delivery systems, communications, office furniture and equipment, vehicles and other work equipment, and other property.
Source: U.S. FERC Form 6, oil-pipeline companies annual reports, 1988.

Fig. 3

Gas-pipeline construction costs



*Generally includes engineering, supervision, administration and overhead, interest, contingencies, [illegible], and FERC filing fees.
Source: U.S. FERC construction-permit applications, July 1, 1988, to June 30, 1989.

which were for offshore.

For the 12-month period July 1, 1987, to June 30, 1988, 5,519.75 miles of pipeline were proposed of which 401.3 miles were planned for offshore.

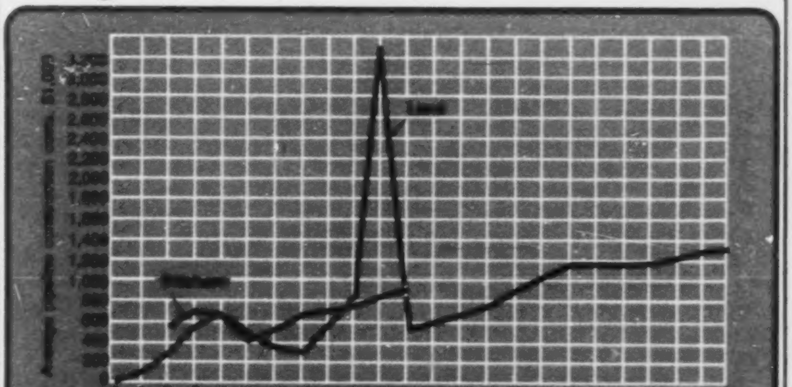
Oil & Gas Journal's Worldwide Construction Report (OGJ, Oct. 16, p. 78) lists 70 individual pipeline projects totaling more than 9,000 miles of U.S. pipeline construction reported by surveyed companies as either proposed, planned, or under way.

By comparison, OGJ's Oct. 24, 1988, construction report listed 83 U.S. pipeline projects proposed, planned, or under way, totaling more than 11,400 miles.

Natural-gas pipeline projects reported in this year's construction report total 8,340 miles of pipeline. The report a year ago listed gas-pipeline projects totaling more than 8,700

Fig. 4

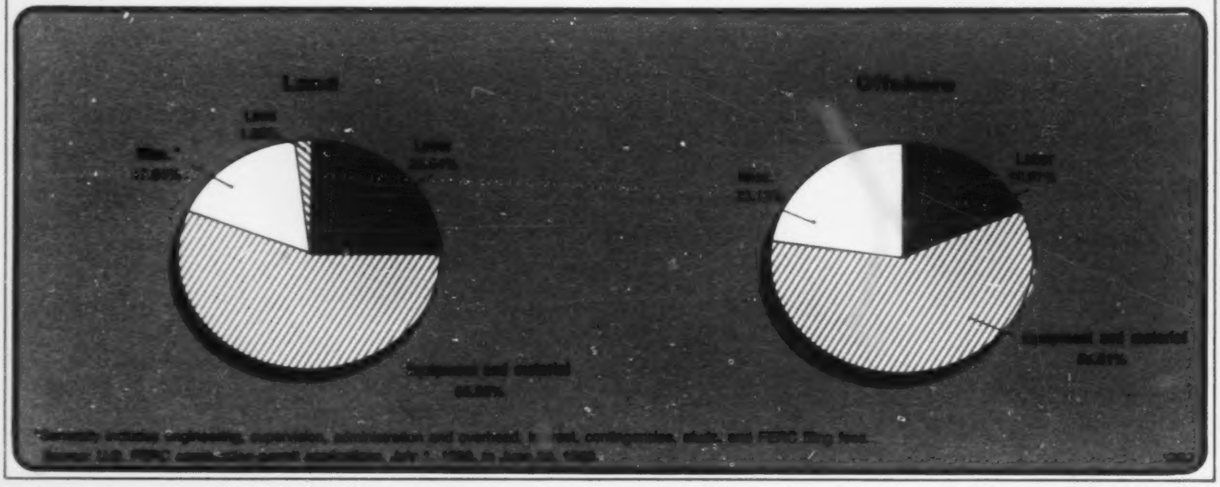
Average construction costs*



*Gas-pipeline construction in U.S. †One project each for 22 and 48-in. diameter land projects and for 6, 8, and 10-in. diameter offshore projects. The 22 in. land project involves a channel crossing.
Source: U.S. FERC construction-permit applications, July 1, 1988, to June 30, 1989.

Fig. 5

Compressor-station costs



*Generally includes engineering, supervision, administration and overhead, [illegible] contingencies, [illegible] and FERC filing fees.
Source: U.S. FERC [illegible] applications, July 1, [illegible] to June 30, [illegible]

Top 10 interstate liquids pipelines—1988

Company	Mileage*	Company	Trunkline traffic Million bbl-miles	Company	Income $1,000
1. Amoco Pipeline Co.	12,297C	Colonial Pipeline Co.	658,014P	Sohio Alaska Pipeline Co.	482,913
2. Mobil Pipe Line Co.	9,683C	Lakehead Pipe Line Co. Inc.	366,739P	Exxon Pipeline Co.	304,700
3. Exxon Pipeline Co.	19,378C	Sohio Alaska Pipeline Co.	294,321C	ARCO Pipe Line Co.	217,588
4. Chevron Pipe Line Co.	8,130P	Exxon Pipeline Co.	170,391C	Colonial Pipeline Co.	157,057
5. Mid-America Pipeline Co.	8,100P	ARCO Pipe Line Co.	166,115C	Amoco Pipeline Co.	102,377
6. Conoco Pipeline Co.	7,895C	Explorer Pipeline Co.	129,220P	Mobil Pipe Line Co.	82,961
7. Shell Pipe Line Corp.	7,235C	Amoco Pipeline Co.	123,362C	Chevron Pipe Line Co.	81,950
8. ARCO Pipe Line Co.	16,839C	Plantation Pipe Line Co.	118,068P	Shell Pipe Line Corp.	70,062
9. Williams Pipe Line Co.	6,780P	Shell Pipe Line Corp.	113,814C	Southern Pacific Pipe Line L.P.	61,199
10. Texaco Pipeline Co.	6,275C	Chevron Pipe Line Co.	97,601P	Lakehead Pipe Line Co. Inc.	59,077
Total	81,794		2,237,645		$1,619,884
Part of all companies, %	48.73		61.84		84.87
1987 totals	80,744		2,104,878		$1,836,671

Source: U.S. FERC Form 6: Annual Report of Oil Pipeline Companies, Dec. 31, 1988. *C = mostly or exclusively crude oil; P = mostly or exclusively product. †Includes 818 miles for Trans-Alaska Pipeline; to avoid duplication, the total includes 818 miles only once. ‡Excludes 1,097 miles of ammonia pipelines.

Top 10 U.S. gas-pipeline companies—1988

Company	Mileage	Company	Sales MMcf	Company	Net income, $1,000
1. Northern Natural, Div. of Enron	23,924	Texas Eastern Transmission Corp.	679,106	Tennessee Gas Pipeline Co.	854,388
2. El Paso Natural Gas Co.	21,709	Natural Gas Pipeline of America	393,822	ANR Pipeline Co.	165,116
3. Columbia Gas Transmission Corp.	18,804	Columbia Gas Transmission Corp.	390,563	Northern Natural, Div. of Enron	108,969
4. Tennessee Gas Pipeline Co.	14,171	Northern Natural, Div. of Enron	387,434	Arkla Inc.	104,224
5. Natural Gas Pipeline of America	12,771	Tennessee Gas Pipeline Co.	380,964	Southern Natural Co.	79,379
6. Panhandle Eastern Pipe Line Co.	12,660	Pacific Gas Transmission Co.	371,350	Colorado Interstate Gas Co.	67,125
7. K N Energy Inc.	12,233	Arkla Inc.	342,026	Texas Eastern Transmission Corp.	61,947
8. ANR Pipeline Co.	11,534	Florida Gas Transmission Co.	236,197	CNG Transmission Corp.	61,557
9. Transcontinental Gas Pipe Line Corp.	10,728	Transcontinental Gas Pipe Line Corp.	234,017C	Iowa-Illinois Gas and Electric Co.	58,426
10. Enserch Corp.	10,593	CNG Transmission Corp.	220,707	Northern Border Pipeline Co.	57,499
Totals	149,117		3,636,186		$1,618,630
Part of majors, %	98.89		55.38		114.37
Part of all companies, %	92.89		47.00		102.93
1987 totals	151,514		3,608,745		$1,173,828

Source: U.S. FERC Form 2: Annual Report for Major Natural Gas Companies, Dec. 31, 1988.

miles.

Prospects for some of these lines being built are better now than at any time in the last 5 years.

Nonetheless, many projects are competing for the same markets, as Table 3 shows, or may still become uneconomical in the currently shifting petroleum markets.

This seems especially true for pipelines proposed to bring natural gas from Canadian producers into the U.S., the myriad of major system additions and expansions into the U.S. Northeast, and projects competing to supply natural gas to EOR projects and power-generation markets in California.

Crude-oil projects in the latest Oil & Gas Journal Worldwide Construction Report total eight comprising 985 miles. Here, also, the construction report a year ago lists six crude-oil pipeline projects totaling 1,820 miles.

Finally, the latest Journal report shows 5 product-pipeline projects with 75 miles of pipeline. A year ago, 11 projects totaling 874 miles were reported.

U.S. interstate network

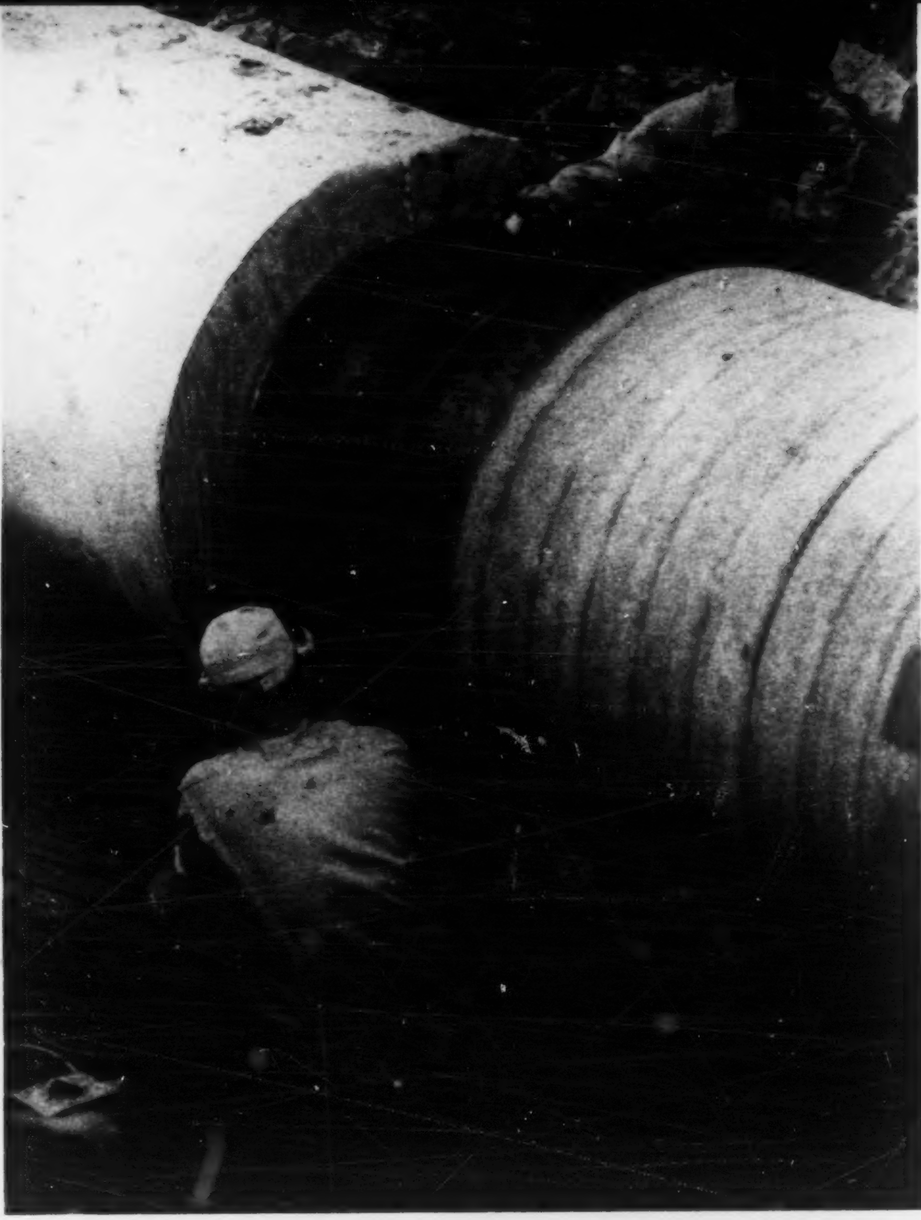
Revenue, income, and mileage changes cited earlier are evident on the pipeline-company tables (p. 60).

These data are based on annual reports of the regulated interstate pipeline companies and provide a variety of detail on each of them, including pipeline mileage, crude-oil and refined-products deliveries, natural-gas sales and deliveries of gas for others, operating revenues, and net incomes.

In last year's Pipeline Economics Report (OGJ, Nov. 28, 1988, p. 33), the Journal began tracking volumes of gas transported for others by major interstate pipeline systems as a method of keeping track of the changing nature of the U.S. gas-transmission industry.

System utilization. Comparisons between any years of U.S. petroleum and natural-gas pipeline mileages must be done with care for two reasons:

The number of companies required to file reports with the FERC varies each year.



Welders connect sections of coated and concrete-weighted pipe as part of a crossing of the Susquehanna River on Texas Eatern Transmission Corp.'s $456-million, 281-mile replacement and expansion project across Pennsylvania.

And, the FERC's system for classifying interstate natural-gas pipeline companies changed with the 1984 reporting year (OGJ, Nov. 25, 1985, p. 55).

Companies are now classified as "major" or "nonmajor" based on total natural-gas transmissions for each of the 3 previous reporting years. (See FERC Accounting and Reporting Requirements for Natural Gas Companies, para. 20-011.)

Major pipeline companies are those whose combined gas sold for resale and gas transported or stored for a fee exceeded 50 bcf at 14.73 psi (60° F.) in each of the 3 previous calendar years.

Nonmajors are companies not classified as majors and having had total gas sales of volume transactions exceeding 200 MMcf at 14.73 psi (60° F.) in each of the 3 previous calendar years.

One effect of this change has been that companies classified as nonmajor are exempt from filing certain data, chief among the excluded figures being mileage and gas-sales or transportation figures. Many nonmajor companies nonetheless file such data voluntarily, but consistency exists only among major companies.

In comparison, figures for nonmajor companies should be excluded from a calculation of total U.S. interstate pipeline utilization for any given year because of their unreliability year to year.

Therefore, combining 1988 mileage data for all regulated liquids-pipeline companies (170,457) with mileage reported by the major natural-gas pipeline companies (43 companies reporting 254,065 miles) yields a total figure of 424,522. This represents a 1% increase of 4,210 miles over the comparable figures reported for 1987 (167,865 + 252,447 = 420,312).

This compares with a similarly small change for 1987 over 1986, a drop of 3,343 miles for all liquids and major natural-gas pipelines.

At the end of 1988, reports from liquids-pipeline companies show a total of 34,311 miles of gathering lines, 55,900 miles of crude-oil trunk lines, and 80,246 miles of products pipelines.

For liquids pipeline companies, the criterion determining which company must file an annual report (Form 6) is whether the FERC determines the company to be an interstate common-carrier pipeline.

These reports for 1988 show that gathering lines decreased by 744 miles (2.1%). Crude lines increased by 1,014 miles (1.9%) and products lines by 2,322 miles (2.98%) over totals reported for 1987.

These figures are in line with the

Current pipeline costs

Size, in.	Location*	Length, miles	Cost, $					
			Material	Labor	Misc.†	R.O.W. & damages	Total	$/mile
LAND PIPELINES								
2	Nebraska (R)	1.30	22,200	18,120	14,574	6,426	61,320	47,169
2	Nebraska (R)	2.00	24,000	21,000	19,000	7,000	71,000	35,500
2	Nebraska (R)	6.80	82,000	70,000	57,000	23,000	232,000	34,118
4	W. Virginia-Penn.	4.00	493,566	1,191,474	202,297	191,808	2,079,145	519,786
4	Nebraska (R)	30.00	508,000	412,198	332,562	146,651	1,399,411	46,647
6	Tennessee (L)	1.05	70,000	234,600	152,854	70,000	527,454	502,337
6	W. Virginia-Penn.	2.00	217,434	597,526	131,523	96,192	1,042,675	521,338
6	Oklahoma	5.02	174,672	171,748	173,580	72,000	592,000	117,928
8	Pennsylvania	1.41	212,000	534,000	108,896	40,000	894,896	634,678
8	Alabama	2.40	420,000	920,000	322,168	—	1,662,168	692,570
8	W. Virginia-Penn.	6.00	681,000	1,759,000	393,840	288,000	3,121,840	520,307
10	Connecticut (R)	0.90	112,400	575,700	446,473	135,000	1,268,573	1,409,526
10	Nevada (L)	1.70	191,000	87,000	161,996	20,000	459,996	270,586
12	Conn.-Rhode Island	3.80	775,000	3,980,000	516,792	340,000	5,611,792	1,476,787
12	Connecticut (L)	4.90	1,000,000	4,035,000	141,625	955,000	6,131,625	1,251,352
12	Oklahoma	6.82	509,832	437,748	394,275	98,145	1,440,000	211,144
12	Oklahoma	12.40	977,000	715,500	294,500	386,700	2,373,700	191,427
12	New York	13.90	1,214,000	3,016,000	2,296,868	310,000	6,836,868	491,861
12	New York	26.00	2,291,000	3,685,000	1,526,717	1,375,000	8,877,717	341,451
16	Conn.-Rhode Island (L)	2.10	545,000	2,170,000	313,112	365,000	3,393,112	1,615,768
16	North Carolina	7.50	776,700	2,159,600	758,111	185,700	3,880,111	517,348
16	Nevada	15.50	1,554,000	1,489,000	1,691,911	70,000	4,804,911	309,994
16	Louisiana	45.00	4,074,100	4,409,900	1,028,700	1,152,000	10,664,700	236,993
20	Alabama	0.25	343,300	229,700	117,266	4,400	694,666	2,778,664
20	New York	0.30	111,200	134,100	85,300	12,500	343,100	1,143,667
20	Pennsylvania	0.38	184,400	41,600	55,500	—	281,500	740,789
20	Tennessee (R)	1.07	155,000	657,000	189,503	10,000	1,011,503	942,687
20	Pennsylvania	2.48	660,000	674,000	615,640	—	1,949,640	786,145
20	New Jersey (L)	3.81	748,700	1,507,587	602,575	187,500	3,046,362	799,570
20	New Jersey (L)	4.56	861,270	2,031,700	857,309	218,850	3,969,129	870,423
20	Massachusetts (R)	5.20	1,440,000	5,745,000	724,531	310,000	8,219,531	1,580,679
20	Ohio	5.61	1,413,000	3,276,000	568,380	196,000	5,453,380	972,082
20	Arkansas (L)	8.70	1,062,800	1,055,200	989,622	84,000	3,191,622	366,853
20	Penn.-New Jersey	57.50	11,099,800	24,874,000	7,388,615	6,422,700	49,785,115	865,828
22	Tennessee (C)	0.48	325,000	857,600	375,600	8,000	1,566,200	3,263,000
24	Rhode Island (L)	1.60	665,000	2,225,000	323,296	285,000	3,498,296	2,186,435
24	Alabama	3.50	1,250,915	635,519	503,226	156,800	2,546,460	727,560
24	Alabama	4.17	1,288,399	567,335	516,747	187,500	2,559,981	613,904
24	Alabama	4.20	1,471,200	1,137,600	479,937	—	3,088,737	735,414
24	Pennsylvania (L)	5.00	1,222,000	3,154,000	518,000	216,000	5,110,000	1,022,000
24	Massachusetts (L)	5.50	2,010,000	5,125,000	780,694	920,000	8,835,694	1,606,490
24	Virginia	27.00	6,110,700	8,797,300	2,915,429	4,368,300	22,191,729	821,916
24	Pennsylvania	83.00	18,173,000	26,126,300	14,223,106	3,000,000	61,522,406	741,234
24	Alabama	86.00	14,372,100	12,218,500	4,642,560	2,752,000	33,985,160	395,176
24	Oklahoma-Arkansas	191.00	35,632,000	31,587,900	10,705,600	1,687,000	79,612,500	416,819
30	Alabama	1.00	757,800	395,400	251,630	17,600	1,422,430	1,422,430
30	Iowa-Illinois (C)	2.00	1,087,200	3,516,100	1,296,700	100,000	6,000,000	3,000,000
30	Pennsylvania	7.60	2,644,700	3,089,600	787,300	255,500	6,777,100	891,724
30	Arkansas (L)	12.00	2,646,800	2,182,900	2,115,062	115,900	7,060,662	588,389
30	New York (L)	12.30	4,150,000	5,221,800	2,167,800	492,000	12,031,600	978,179
30	California (L)	12.96	3,328,000	2,986,000	1,253,921	144,000	7,711,921	595,056
30	Pennsylvania (L)	15.15	1,917,490	2,870,686	1,208,779	82,400	6,079,355	1,180,457
30	Arkansas (L)	16.30	4,092,400	3,390,700	3,318,620	180,200	10,981,920	673,737
30	Oklahoma	22.61	5,265,100	4,112,900	4,183,065	255,300	13,816,365	611,073
30	Alabama	24.50	8,877,800	4,996,000	3,761,004	661,100	18,295,904	746,772
30	New Jersey-New York	38.70	22,151,000	49,449,000	9,519,927	3,072,000	84,191,927	2,175,502
30	Oklahoma-Arkansas (L)	50.20	11,151,200	9,131,700	8,964,918	484,800	29,732,618	592,283
30	Alabama	52.50	14,812,200	11,108,800	5,046,746	2,500,500	33,468,246	637,490
30	Texas	94.30	25,892,000	13,974,000	4,753,000	1,886,000	46,505,000	493,160
30	Oklahoma	97.50	26,469,000	14,608,000	4,881,000	1,804,000	47,762,000	489,867

erratic pattern of liquids-pipeline utilization for the past 8 years (Table 2). Natural-gas transmission lines were up over 1987 by 5,614 miles (2.83%) for all companies and by 5,986 miles (3.3%) for major companies.

Field lines for all companies showed a fractional decrease of 588 miles and by 556 among major companies.

For all companies as well as majors, storage lines decreased last year over 1987: down 3,730 miles (43.8%) for all companies, 3,812 miles (45.7%) for majors.

Deliveries rise. Throughput for liquids-pipeline companies in 1988 showed healthy gains over 1987.

Natural-gas pipelines, sales rose slightly in 1988, by 117.1 bcf (+1.9%) for majors and by almost 222.2 bcf (3%) for all companies.

But the major story continues to be the shift of natural-gas pipeline companies from their historic role as buyers-for-resale of gas to transporters. This shift, going on now for almost 5 years, was evident in 1988 in the volumes of gas regulated interstate pipeline companies transported for others.

For last year, all regulated U.S. interstate gas pipelines carried 16.5

Table 3

Size, in.	Location*	Length, miles	Cost, $ Material	Labor	Misc.†	R.O.W. & damages	Total	$/mile
LAND PIPELINES—continued								
36	New Jersey (L)	0.86	559,038	746,734	350,633	126,500	1,782,905	2,073,145
36	Connecticut (L)	2.00	1,400,000	2,600,000	425,114	395,000	4,820,114	2,410,057
36	Connecticut (L)	2.00	1,085,000	2,585,000	405,632	345,000	4,420,632	2,210,316
36	New Jersey (L)	4.13	2,066,180	3,363,092	1,484,816	608,120	7,522,208	1,821,358
36	Pennsylvania (R)	7.50	4,511,000	8,433,000	1,945,047	556,000	15,445,047	2,059,340
36	Pennsylvania (L)	8.00	4,209,042	4,664,288	2,562,896	256,000	11,692,226	1,461,528
36	New York (L)	8.20	5,245,000	10,430,000	1,711,735	2,060,000	19,446,735	2,371,553
36	Pennsylvania (L)	12.48	6,519,119	7,177,413	3,473,397	399,400	17,569,329	1,407,799
36	Pennsylvania (L)	12.59	6,621,560	7,235,685	3,909,853	402,800	18,169,898	1,443,201
36	Ohio-Pennsylvania (L)	17.53	8,454,000	12,520,000	2,840,433	611,000	24,425,433	1,393,350
36	Pennsylvania (L)	29.89	12,426,000	22,405,000	4,759,659	2,209,000	41,799,659	1,398,450
36	Penn.-New Jersey	34.84	17,907,000	37,005,000	7,148,934	1,790,000	63,850,934	1,832,690
36	W. Virginia-Penn.	36.18	15,609,000	24,690,000	5,173,342	1,262,000	46,734,342	1,291,718
36	Idaho-Washington (L)	95.60	37,240,000	32,607,000	18,098,890	1,059,155	89,005,045	931,015
36	Idaho-Washington (L)	96.40	36,922,000	24,984,000	17,334,570	1,003,515	80,244,085	832,407
36	Pennsylvania	107.43	40,678,000	64,691,000	14,941,014	5,407,000	125,717,014	1,170,223
36	Pennsylvania	107.58	47,245,000	66,718,000	16,148,566	5,426,000	135,537,566	1,259,877
36	Idaho-Washington (L)	134.30	51,093,000	47,122,000	26,877,020	1,489,290	126,581,310	942,527
42	New Jersey	2.56	2,057,000	4,088,000	818,382	279,000	7,242,382	2,829,055
42	New Jersey (L)	3.86	2,109,756	5,020,357	2,106,567	568,100	9,804,780	2,540,098
42	New Jersey	5.50	4,276,000	6,849,000	1,490,507	320,000	12,935,507	2,351,910
42	Georgia (L)	12.05	5,462,610	3,995,160	2,593,514	327,760	12,379,044	1,027,307
42	Idaho-Washington (L)	103.70	52,649,000	29,986,000	22,275,090	1,201,555	106,111,645	1,023,256
48	Alabama (L)	15.17	8,743,954	5,975,585	3,978,801	461,130	19,159,470	1,262,984
Total-land projects		**2,023.78**	**$627,865,702**	**$732,263,552**	**$276,475,508**	**$87,519,197**	**$1,704,123,959**	**$842,050**
1988-report total/land		5,118.45	$1,111,105,674	$1,441,542,887	$606,328,053	$205,829,349	$3,364,805,963	$657,388
OFFSHORE PIPELINES								
6	Louisiana	4.90	404,600	1,700,000	708,928	–	2,813,528	574,189
8	Alabama	2.40	420,000	920,000	322,168	–	1,662,168	692,570
10	Louisiana	4.02	741,339	1,654,580	677,683	100	3,073,702	654,042
12	Alabama	9.00	1,807,000	2,673,000	623,900	2,000	5,105,900	567,322
12	Louisiana	34.30	5,467,100	4,000,000	3,123,000	–	12,591,000	367,085
12	Alabama	7.80	1,640,000	1,630,000	901,293	–	4,171,293	534,781
16	Alabama	8.70	2,460,000	3,510,000	1,222,825	–	7,192,825	826,762
16	Louisiana	10.22	2,636,090	3,364,930	1,744,192	246	7,745,458	757,873
16	Alabama	17.20	3,780,000	3,720,000	1,626,924	–	9,126,924	530,635
16	Louisiana	26.57	6,734,150	6,067,876	3,927,727	499	16,730,252	629,667
20	Mississippi	7.40	3,661,250	3,203,750	4,149,868	5,000	11,019,868	1,489,171
20	Alabama	10.10	2,620,000	2,710,000	1,141,397	–	6,471,397	640,732
20	Louisiana	25.39	7,484,096	8,940,018	4,811,499	476	21,236,089	836,396
20	Miss.-Alabama	27.07	7,780,298	6,135,901	4,298,561	510	18,215,270	672,895
20	Alabama	29.60	10,000,000	7,560,000	2,394,880	10,000	19,964,880	674,489
20	Louisiana-Miss.	30.74	10,027,720	7,065,757	5,176,936	565	22,290,978	725,146
24	Louisiana (L)	11.15	4,582,000	5,991,000	1,429,600	3,000	12,005,600	1,076,735
24	Alabama	13.80	6,504,810	9,788,504	4,169,284	105,061	20,567,659	1,490,410
24	Louisiana	20.03	7,809,000	5,200,000	2,237,830	–	15,246,830	761,200
24	Alabama	31.20	10,788,800	8,342,400	3,519,540	–	22,650,740	725,985
24	Louisiana	55.00	21,786,000	17,676,000	5,352,832	403,000	45,217,832	822,142
Total–OFFSHORE PROJECTS		**388.50**	**$119,134,253**	**$111,873,716**	**$53,581,787**	**$530,457**	**$285,100,180**	**737,474**
1988 report total/offshore projects		401.30	$151,556,000	$84,126,000	$67,432,755	$5,000	$303,119,756	$755,345
Total–ALL PROJECTS		**2,410.37**	**$746,999,955**	**$844,137,268**	**$330,037,275**	**$88,049,654**	**$1,989,224,152**	**$825,278**
1988–REPORT TOTAL		**5,519.75**	**$1,262,661,674**	**$1,525,668,887**	**$673,760,808**	**$205,829,346**	**$3,667,940,718**	**$684,505**

Source: U.S. FERC construction permit applications, July 1, 1988, to June 30, 1989.
*L = Loop; R = Replacement; C = River or channel crossing. † Generally includes engr., supv., surveying, interest, adm. & overheads, contingencies, Afudc, and FERC fees.

tcf of gas for others; of those volumes, majors carried nearly 15.6 tcf. For all companies, volumes of gas transported for others rose 3.2 tcf (+24%); for majors the rise was almost 2.8 tcf (+21.6%).

Volumes of gas transported for others in 1988 by all interstate gas-pipeline companies (16.5 tcf) comprised 68% of total volumes (24.07 tcf) moved through the U.S. system, up from almost 65% for 1987. For major companies (whose total volumes slightly exceeded 22 tcf), the share was a bit larger: more than 71%. This share also represented an increase over the 1987 figure, up from 67%.

In future reports, trends in the transportation of gas for others will be examined.

Crude-oil and product deliveries last year again approached 11.5 billion bbl, an increase over 1987 of 289 million bbl, or only about 2.6%.

Crude-oil deliveries through the U.S. interstate system rose last year by 231.7 million bbl, or an increase of 3.7%.

Product deliveries were up by 57.6 million bbl (1.2%).

Trunkline traffic for U.S. crude-oil and product pipelines showed a bit more life last year than in 1987, ad-

Table 4

Investment in liquids pipelines

	Company and investment, $						
	A	B	C	D	E	Total, $	%
CRUDE PIPELINES INVESTMENT BY FIVE COMPANIES							
Land	1,787,499	814,497	292,759	1,001,563	1,194,975	5,091,293	0.30
Right of way	12,288,388	1,006,210	316,392	16,428,203	15,627,321	45,666,514	2.67
Line pipe	138,917,243	25,705,045	7,797,471	97,880,236	154,588,584	424,888,579	24.83
Line pipe fittings	9,888,276	922,085	1,386,293	17,591,909	28,249,661	58,038,224	3.39
Pipeline construction	203,189,839	27,810,895	10,931,879	222,373,192	228,611,206	692,917,011	40.49
Buildings	22,411,241	4,967,781	2,473,633	13,752,261	10,738,992	54,343,908	3.18
Boilers	—	—	—	—	—	—	
Pumping equipment	25,374,049	5,524,747	2,414,882	17,381,420	48,587,557	99,282,655	5.80
Machine tools and machinery	—	—	—	33,140	—	33,140	0.00
Other station equipment	93,848,747	21,881,549	4,601,583	45,653,071	33,947,215	199,932,165	11.68
Oil tanks	14,531,122	5,991,716	5,678,530	17,074,367	26,633,026	69,908,761	4.09
Delivery facilities	—	—	5,357,432	1,569,207	6,820,018	13,746,657	0.80
Communications systems	886,153	3,196,680	70,566	11,373,089	3,692,707	19,219,195	1.12
Office furniture and equipment	1,973,669	250,029	230,421	2,257,128	899,485	5,610,732	0.33
Vehicles and other work equip.	8,509,180	846,444	512,646	6,250,181	245,786	16,364,237	0.96
Other property	—	1,309,285	—	—	4,767,315	6,076,600	0.36
Total	**$533,605,406**	**$100,226,963**	**$42,064,487**	**$470,818,967**	**$564,603,848**	**$1,711,119,671**	***100.00**
PRODUCT PIPELINES INVESTMENT BY FIVE COMPANIES							
Land	4,422,773	1,763,961	574,646	936,246	3,250,670	10,948,296	0.37
Right of way	29,644,947	10,829,964	19,697,239	8,777,747	6,834,819	75,784,716	2.58
Line pipe	345,795,587	67,590,791	107,841,055	87,382,990	98,196,581	706,807,004	24.09
Line pipe fittings	72,357,196	12,889,746	15,970,328	1,732,982	21,615,003	124,565,255	4.24
Pipeline construction	582,101,592	109,237,361	203,656,797	101,968,825	143,747,696	1,140,712,271	38.87
Buildings	23,951,907	4,067,919	5,267,726	10,625,847	16,747,663	60,661,062	2.07
Boilers	—	—	—	—	—	—	—
Pumping equipment	45,685,261	6,182,370	30,499,386	28,200,014	20,059,120	130,626,151	4.45
Machine tools and machinery	—	—	—	—	407,435	407,435	0.01
Other station equipment	120,823,235	21,212,683	37,825,620	23,395,650	116,266,346	319,523,534	10.89
Oil tanks	48,834,579	17,463,369	8,964,158	17,465,781	61,094,267	153,822,154	5.24
Delivery facilities	—	—	9,509,419	10,821,471	47,518,440	67,849,330	2.31
Communication systems	1,353,992	558,106	2,371,291	8,878,183	—	13,161,572	0.45
Office furniture and equipment	10,277,081	2,426,975	2,638,126	640,018	958,420	16,940,620	0.58
Vehicles and other work equip.	5,641,235	1,853,004	7,957,202	2,449,576	2,332,710	20,233,727	0.69
Other property	73,357,374	—	19,089,144	—	—	92,446,518	3.15
Total	**$1,364,246,459**	**$256,076,249**	**$471,862,137**	**$303,275,330**	**$539,029,170**	**$2,934,489,345**	***100.00**

Source: U.S. FERC Form 6, Annual Report of Oil Pipeline Companies, Dec. 31, 1988.

* Actual total may be inexact due to rounding.

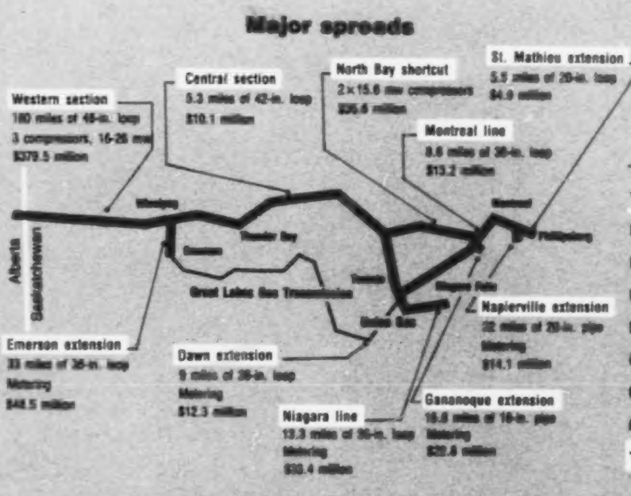
vancing by 95.1 billion bbl-miles (2.7%) over that for 1987.

Crude-oil trunkline traffic increased by 37.7 billion bbl-miles (2%). Product traffic also increased by 57.4 billion bbl-miles (3.6%).

Rankings. Oil & Gas Journal ranks the top 10 natural-gas and liquids pipeline companies in three categories: mileage, natural-gas sales or liquids barrel-mile throughput, and operating income (p. 46). These rankings are broken out from the pipeline-company tables (pp. 60-66).

For all natural-gas pipeline compa-

TransCanada Pipeline's proposed expansion*


Major spreads
Western section
180 miles of 48-in. loop
3 compressors, 16-26 mw
$379.5 million
Central section
5.3 miles of 42-in. loop
$10.1 million
North Bay shortcut
2×15.6 mw compressors
$35.6 million
St. Mathieu extension
5.5 miles of 20-in. loop
$4.9 million
Montreal line
8.6 miles of 30-in. loop
$13.2 million
Winnipeg
Thunder Bay
Emerson
Montreal
Philipsburg
Alberta
Saskatchewan
Great Lakes Gas Transmission
Toronto
Niagara Falls
Union Gas
Napierville extension
22 miles of 20-in. pipe
Metering
$14.1 million
Emerson extension
33 miles of 36-in. loop
Metering
$48.5 million
Dawn extension
9 miles of 36-in. loop
Metering
$12.3 million
Niagara line
13.3 miles of 36-in. loop
Metering
$33.4 million
Gananoque extension
16.8 miles of 16-in. pipe
Metering
$22.6 million

Cost elements

	Costs, $1,000				
Type	Pipeline	Compression	Metering	Other	Total
Materials	262,708	67,275	7,935	7,700	345,618
Installation	220,146	44,019	5,140	0	269,305
Land	10,095	0	450	0	10,545
Engineering	4,701	2,040	250	0	6,991
Contingency	24,883	5,667	688	385	31,623
Overhead	6,270	1,428	174	97	7,969
Afudc	29,084	6,624	805	450	36,963
Total	**$557,887**	**$127,052**	**$15,442**	**$8,632**	**$709,014**

(Source: Canadian National Energy Board.) All costs are direct costs and estimated in $Can. as of June 1989.

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Table 5

10-year land construction cost trends

Size	Year*	Average cost, $/mile					Range, $/mile	
		R.O.W.	Material	Labor	Misc.	Total	Low	High
8 in.	1989	33,945	130,785	330,581	83,558	578,869	520,307	692,570
	1988	7,619	58,695	56,381	37,363	160,058	116,856	220,000
	1987	20,032	55,430	75,568	30,581	181,611	151,193	652,036
	1986	14,763	44,703	63,102	32,958	155,527	137,033	193,846
	1985	3,141	28,144	47,317	16,283	94,884	64,203	228,866
	1984	22,339	49,974	175,733	74,086	322,132	223,767	540,655
	1983	6,244	48,392	89,600	23,088	167,324	159,940	178,020
	1982	8,996	46,002	67,950	31,769	154,717	73,596	572,926
	1981	8,119	34,860	23,528	20,884	87,391	55,981	109,078
	1980	8,247	39,040	102,839	13,036	163,162	149,926	200,554
12 in.	1989	43,896	96,918	227,288	79,788	447,890	191,427	1,476,787
	1988	52,772	85,487	268,169	89,656	496,085	261,697	1,873,852
	1987	26,018	81,675	161,790	67,404	336,826	166,473	669,332
	1986	43,656	94,786	243,533	101,683	483,657	186,180	1,201,356
	1985	26,582	74,620	106,447	46,164	253,813	131,765	767,548
	1984	23,035	147,750	211,783	93,481	476,050	338,872	608,685
	1983	5,135	91,492	73,042	20,754	190,423	177,050	218,265
	1982	10,536	84,972	102,390	32,173	230,071	130,252	669,227
	1981	3,855	71,444	65,613	11,861	152,773	55,981	369,018
	1980	2,610	54,235	41,089	14,111	112,045	78,428	901,282
16 in.	1989	25,288	99,141	145,913	54,092	324,434	236,993	1,615,768
	1988	34,217	114,232	185,798	56,558	390,805	203,181	2,256,422
	1987	34,775	109,042	187,216	68,857	399,890	190,946	†3,334,886
	1986	21,474	104,368	183,134	53,546	362,523	302,102	1,071,477
	1985	8,511	80,529	47,708	20,091	156,839	154,746	167,876
	1984	15,106	131,139	111,234	82,747	340,226	231,790	363,718
	1983	31,542	337,088	929,969	278,159	1,576,758	447,890	2,370,748
	1982	6,278	104,319	113,380	21,936	245,913	175,715	430,841
	1981	9,203	110,684	133,968	40,424	294,279	140,674	590,112
	1980	7,404	74,571	57,681	18,050	157,706	118,085	471,972
20 in.	1989	82,862	202,309	446,538	135,703	867,411	366,853	2,778,664
	1988	27,225	139,302	170,120	58,787	345,225	246,260	2,776,416
	1987	35,655	139,346	172,071	68,265	415,337	274,034	904,487
	1986	29,227	134,332	182,623	82,657	428,839	175,000	1,077,419
	1985	108,870	187,379	190,886	144,974	632,109	353,088	1,277,454
	1984	16,735	175,406	190,088	63,302	445,531	226,415	616,250
	1983	12,682	147,354	154,811	46,073	360,934	237,600	476,104
	1982	12,284	124,148	128,148	30,649	295,229	210,378	482,464
	1981	8,556	122,659	114,147	30,370	275,732	227,679	1,741,597
	1980	11,470	130,438	73,751	48,213	263,872	157,947	533,265
24 in.	1989	26,328	165,032	193,096	75,348	459,804	446,819	2,186,435
	1988	49,494	231,264	360,603	145,358	786,719	431,093	§4,289,167
	1987	34,785	254,677	271,319	110,959	671,741	405,987	2,043,000
	1986	43,746	245,807	378,917	170,094	838,565	355,428	1,607,660
	1985	26,648	296,486	305,437	151,657	780,228	469,318	4,893,740
	1984	29,133	289,487	298,521	128,390	745,531	395,676	1,772,049
	1983	31,416	310,583	501,401	148,993	995,393	608,781	1,649,454
	1982	28,537	508,226	807,847	120,895	1,465,505	(†)	(†)
	1981	30,078	269,414	395,204	127,790	822,486	350,898	826,088
	1980	14,220	162,019	152,406	52,114	380,759	230,122	820,295
30 in.	1989	26,090	294,249	285,222	116,421	721,981	489,867	3,000,000
	1988	47,502	260,549	322,973	137,019	768,043	526,637	§4,858,168
	1987	25,506	257,158	308,383	161,008	752,054	477,195	1,584,483
	1986	34,035	268,922	253,838	120,603	677,397	188,835	1,571,948
	1985	60,408	320,219	314,878	152,035	847,541	668,640	5,778,947
	1984	20,885	336,043	376,631	183,034	916,592	637,546	1,413,826
	1983	23,872	253,071	348,478	116,084	741,506	660,086	1,683,143
	1982	20,756	296,737	362,787	93,103	773,383	548,396	1,179,760
	1981	14,135	309,364	201,037	73,281	597,817	561,358	4,684,745
	1980	13,206	227,229	134,491	46,018	420,944	319,482	921,772
36 in.	1989	35,408	417,820	529,578	180,613	1,163,419	832,407	2,410,057
	1988	59,395	385,007	449,650	204,591	1,098,643	758,869	2,625,105
	1987	45,461	415,118	637,294	144,784	1,242,657	1,170,963	1,923,266
	1986	360,582	428,572	468,960	151,769	1,085,359	714,286	5,264,368
	1985	21,967	389,751	296,742	157,536	865,997	629,179	6,443,590
	1984	36,063	358,876	362,667	152,787	910,393	665,480	2,143,680
	1983	51,436	498,047	490,568	306,666	1,346,717	703,112	2,724,493
	1982	13,429	375,281	176,287	58,733	623,730	615,160	833,546
	1981	5,948	344,374	358,072	74,415	782,809	693,945	1,573,759
	1980	20,677	344,664	268,753	87,850	721,944	528,710	1,105,515

*1980-1982 by calendar year. 1983-88 based on FERC construction-permit applications, by fiscal year. † One report only. § Involves a river crossing.

Table 6

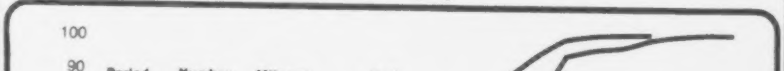
Current compressor-station costs

Location*	Horsepower	Equipment & material	Labor	Land	Misc.†	Total	$/hp
		$					
Tennessee†	1,100	720,000	575,000	100,000	294,172	1,689,172	1,536
Tennessee†	1,100	870,000	600,000	–	305,981	1,775,981	1,615
North Carolina	1,200	1,501,000	894,000	–	357,088	2,752,088	2,293
Tennessee†	1,280	955,000	600,000	–	317,791	1,872,791	1,463
Tennessee	1,280	1,180,000	775,000	84,000	408,650	2,447,650	1,912
Tennessee	1,280	1,445,000	900,000	550,000	516,748	3,411,748	2,665
Pennsylvania	2,200	2,425,400	575,500	–	479,100	3,480,000	1,582
New York	2,700	4,157,000	3,221,000	3,866,185	46,000	11,290,185	4,181
Pennsylvania	3,000	4,250,000	1,181,000	–	815,120	6,246,120	2,082
Pennsylvania	3,000	1,030,000	582,000	–	340,000	1,952,000	651
Pennsylvania	4,000	5,294,000	5,665,000	400,000	1,341,132	12,700,132	3,175
Alabama	4,000	6,200,000	1,500,000	100,000	2,576,069	10,376,069	2,594
Alabama	4,000	4,402,000	3,219,000	450,000	1,037,151	9,108,151	2,277
Arkansas†	4,390	3,451,000	854,000	–	1,672,468	5,977,468	1,362
Virginia	4,390	2,450,000	930,000	–	719,556	4,099,556	934
Virginia	4,390	2,450,000	930,000	–	719,556	4,099,556	934
W. Virginia	4,390	2,356,000	894,000	–	690,000	3,940,000	897
Arkansas	4,500	4,807,000	1,200,000	100,000	2,606,288	8,713,288	1,936
Mississippi†	5,500	2,088,700	700,300	–	933,055	3,722,055	677
California	5,300	2,798,000	1,330,000	35,000	701,271	4,864,271	918
Pennsylvania	5,800	3,260,141	1,345,376	–	1,539,935	6,145,452	1,060
Pennsylvania	5,900	3,450,700	1,215,300	–	894,000	5,560,000	942
Alabama	6,000	4,510,000	3,210,000	–	2,421,156	10,141,156	1,690
Oklahoma	6,750	7,429,500	1,635,000	–	3,365,962	12,430,462	1,842
Pennsylvania	8,000	7,116,500	2,029,500	–	2,437,737	11,583,737	1,448
Arkansas†	8,000	5,714,000	1,000,000	–	2,549,113	9,263,113	1,158
Alabama	8,500	3,230,500	873,500	–	1,298,370	5,402,370	636
Oklahoma	8,700	8,626,000	3,366,000	80,000	1,374,000	13,446,000	1,546
Pennsylvania	11,000	4,817,000	2,673,000	25,000	1,114,094	8,629,094	784
Pennsylvania	11,000	7,611,000	4,887,000	30,000	1,596,975	14,124,975	1,284
Pennsylvania	11,000	8,547,000	5,502,000	30,000	1,796,077	15,875,077	1,443
Pennsylvania	11,000	8,012,000	4,538,000	–	1,509,035	14,059,035	1,278
Ohio	11,000	8,510,000	6,042,000	40,000	1,723,493	16,315,493	1,483
New Jersey	12,000	8,849,600	4,147,700	375,000	4,342,814	17,715,114	1,476
Alabama†	12,600	4,429,500	1,210,500	–	1,832,207	7,472,207	593
Georgia†	12,600	4,115,500	1,137,500	–	1,710,158	6,963,158	553
Pennsylvania†	12,600	5,376,000	1,423,500	–	1,904,475	8,703,975	691
Pennsylvania†	12,600	5,376,000	1,423,500	–	1,691,646	8,491,146	674
Pennsylvania†	12,600	5,133,700	1,748,900	–	1,619,400	8,502,000	675
South Carolina†	12,600	4,106,500	1,128,500	–	1,705,060	6,940,060	551
Pennsylvania	13,500	11,004,667	4,301,000	–	3,043,113	18,348,780	1,359
South Dakota	16,000	8,984,000	2,644,000	–	4,455,900	16,083,900	1,005
Pennsylvania	22,000	12,776,000	8,599,000	50,000	2,731,822	24,156,822	1,098
Texas	31,050	9,704,000	3,740,000	100,000	2,772,450	16,316,450	450
Total–land projects	**345,800**	**$215,519,908**	**$96,946,576**	**$6,415,185**	**$68,306,188**	**$387,187,857**	**$1,120**
1988–REPORT TOTAL LAND PROJECTS	660,565	$338,483,025	$258,899,573	$15,517,911	$164,573,742	$777,474,251	$1,177
OFFSHORE STATIONS							
Alabama	1,200	1,738,000	833,000	–	778,910	3,349,910	2,792
Mississippi	11,000	4,355,500	1,149,500	–	1,650,198	7,155,198	650
Total–offshore projects	**12,200**	**$6,093,500**	**$1,982,500**	–	**$2,429,108**	**$10,505,108**	**$861**
1988–REPORT TOTAL OFFSHORE PROJECTS	–	–	–	–	–	–	–
TOTAL–ALL PROJECTS	**358,000**	**$221,613,408**	**$98,929,076**	**$6,415,185**	**$70,735,296**	**$397,692,965**	**$1,111**
1988–REPORT TOTAL ALL PROJECTS	660,565	$338,483,025	$258,899,573	$15,517,911	$164,573,742	$777,474,251	$1,177

Source: U.S. FERC construction-permit applications, July 1, 1988, to June 30, 1989. * Generally includes engineering, supervision, surveying, interest, administration & overheads, contingencies, Afudc, and FERC fees. † Additions.

Fig. 6

Diameter distribution for pipelines*



Period	Number of projects	Mileage	Cost
7/87-7/88	129	5,118.45	$3,364,805,963
7/88-7/89	84	2,025.78	$1,704,123,959

*U.S. land, gas pipelines.

Source: U.S. FERC construction-permit applications, July 1, 1987 to June 30, 1988, and July 1, 1988, to June 30, 1989.

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nies, net income as a portion of gas-plant investment reversed a slide evident in recent years. This portion stood at 3.1% for 1988, up from 2.9% in 1987. It was 3.4% in 1986, 4.5% in 1985, and 8.7% in 1984.

For major gas pipelines, net income as a portion of gas-plant investment mirrored the change, rising to 3.2% for 1988 after falling to 2.6% in 1987 from 3.2% in 1986.

It was 4.3% in 1985, and 7.6% in 1984.

For 1988, all gas companies reported an industry gas-plant investment totaling almost $51 billion compared to $49.9 billion in 1987, $49.4 billion for 1986, and $48.3 billion for 1985.

Majors' gas-plant investment in 1988 increased to $44 billion from slightly less than $42 billion for 1987 and $42.2 billion for 1986.

For interstate common-carrier liq-

Table 7

Natural-gas pipeline transmission expenses*

	Expenses, $		Cost/mile, $		Cost/MMcf sold, $	
	1986-majors†	1987-majors§	1986-majors†	1987-majors§	1986-majors†	1987-majors§
Operation expenses						
Supervision and engineering	159,699,942	151,679,238	629.59	610.48	20.43	23.45
System control and load dispatching	28,679,686	26,858,420	113.07	108.10	3.67	4.15
Communication system expenses	28,265,422	29,310,758	111.43	117.97	3.62	4.53
Compressor station labor and expenses	239,180,275	251,651,867	942.93	1,012.85	30.60	38.90
Gas for compressor station fuel	532,572,604	367,406,730	2,099.59	1,478.75	68.14	56.80
Other fuel and power for compressor stations	46,066,937	63,842,107	181.61	256.95	5.89	9.87
Mains	182,900,300	168,358,688	721.06	677.61	23.40	26.03
Measuring and regulating station expenses	62,517,614	61,623,174	246.47	248.02	8.00	9.53
Transmission and compression of gas by others	1,267,266,607	1,049,122,569	4,996.01	4,222.53	162.13	162.18
Other transmission expenses	36,206,154	38,278,436	142.74	154.06	4.63	5.92
Rents	17,142,978	18,421,763	67.68	74.14	2.18	2.85
Total operation expenses	**2,597,098,519**	**2,228,583,750**	**10,238.66**	**8,961.49**	**332.27**	**344.19**
Maintenance expenses						
Supervision and engineering	35,545,963	34,596,228	140.14	139.24	4.55	5.35
Structures and improvements	30,638,479	21,181,592	120.79	85.25	3.92	3.27
Mains	93,717,959	91,003,249	369.47	366.27	11.99	14.07
Compressor station equipment	197,872,245	197,326,728	780.08	794.21	25.32	30.50
Measuring and regulating station equipment	12,539,338	12,117,702	49.43	48.77	1.60	1.87
Communication equipment	13,913,234	12,077,950	54.85	48.61	1.78	1.87
Other equipment	3,138,461	3,259,046	12.37	13.12	0.40	0.50
Total maintenance expenses	**387,365,679**	**371,562,495**	**1,527.13**	**1,495.47**	**49.56**	**57.44**
Total transmission expenses	**$2,984,464,198**	**$2,600,146,245**	**$11,765.79**	**$10,456.96**	**$381.83**	**$401.63**
Total miles of transmission pipeline	**253,656**	**248,656**				
Total natural gas sold, MMcf	**7,816,250**	**6,473,984**				

Source: Statistics of Interstate Natural Gas Pipeline Companies—1986 & 1987. U.S. Department of Energy. * U.S. interstate pipelines for calendar years 1986 & 1987. † 44 of 135 companies filing Form 2's or 2A's with the U.S. Federal Energy Regulatory Commission; majors are companies whose combined gas sold for resale and gas transported or stored for a fee exceed 50 bcf (at 14.7 psi; 60° F.) in each of the 3 previous calendar years. §43 of 126 companies filing Form 2's and 2A's with the U.S. FERC for 1987; majors defined in previous note and in U.S. FERC Accounting and Reporting Requirements for Natural Gas Companies, para. 20-011, effective Feb. 2, 1985, beginning with the 1984 reporting year (OGJ, Nov. 25, 1985, p. 80).

uids pipeline companies, net income as a percentage of investment in carrier property fell to 10.3% in 1988 from 11.6% in 1987.

It was 9.2% in 1986, 11.3% in 1985, and 13.1% in 1984.

Liquids pipelines' investment in carrier property for 1988 increased by more than $2.9 billion (+14%) over 1987 which had fallen to slightly less than $22.3 billion compared with $22.4 billion for 1986, $21.6 billion in 1985, and $19.4 billion in 1984.

Another measure of the profitability of oil and natural-gas pipeline companies in recent years is the percentage net income represents of operating income. Through 1987, trends for liquids-pipeline companies and for natural-gas pipeline companies had been heading in opposite directions for 10 years.

For liquids-pipeline companies in 1988, this figure rose to 36.5% from 35% for 1987, 28% in 1986, and 21.9% in 1978. The figure for 1986 represents the only year the percentage has declined (from 32.6% for 1985).

By contrast for all natural-gas pipeline companies, income as a percentage of operating revenues has been steadily falling in the past 10 years.

At the end of 1988, however, it increased to 4.8% from 4.5% for 1987, the latter portion fractionally higher than for 1986. The 10-year decline is evident when the portion for 1978 is noted: 8.3%.

For majors in 1988, income as a percentage of operating revenues was 5.3%.

Tracked companies. In this annual Pipeline Economics Report, Oil & Gas Journal has for several years been tracking investment by five crude-oil pipeline companies and five products-pipeline companies.

Table 4 indicates that investment by the five crude-oil pipelines stood at $1,711.2 million at the end of 1988 compared with $1,661.8 million at the end of 1987, an increase of $49.4 million (2.9%).

Investment by the five products pipeline companies was $2,934.5 million at the end of 1988 compared with $2,890.7 million at the end of 1987, a slight increase of $43.8 million (1.5%).

Fig. 2 illustrates the investment split in the crude-oil and products pipeline companies.

Construction activity

As Fig. 2 shows, the costs of line pipe and fittings and of laying pipelines make up roughly 70% of the cost of a pipeline system.

These elements of pipeline construction costs have risen very little for the past few years, after rapidly increasing before 1982.

Cost trends. Table 5 lists a 10-year land-construction cost trend for natural-gas pipelines with diameters ranging from 8 to 36 in. The table's data are based on a mix of actual costs of completed pipeline construction and projected costs filed under CP dockets with the FERC.

As the table reflects, the average cost per mile for any given diameter may fluctuate from one year to the next as projects' costs are affected by geographic location, terrain, population density, or other factors.

The cost-per-mile trends from 1987 to 1988 are up, with four of seven diameter classifications showing increases.

These are for 8, 16, 20, and 36-in. categories.

Yearly fluctuations in these figures are illustrated in construction figures for a 12-in. pipeline. These had leaped between 1984 and 1985 by 90% but fell in 1988 by more than 30%.

For the period reported on in this year's report, however, the total average cost-per-mile for 12-in. pipeline fell again, this time by $48,195/mile, or 9.7%.

Plans and miles. Table 3 lists 84

ONSHORE PIPELINE PROJECTS

12.4 miles of 12 in., Oklahoma

Item	Cost
Material	$977,000
Installation	715,500
Rights-of-way	386,700
Engineering and supervision	208,000
Interest during construction	61,550
Insurance and warehousing	5,500
FERC filing fee	19,450
Total	$2,373,700
$/mile	$191,427

103.7 miles of 42-in. loop, Idaho-Washington

Item	Cost
Mainline coated pipe	$42,257,000
Valves	592,000
Misc. pipe and fittings	737,000
Casing, 48-in.	123,000
Valve shelters, pipeline markers, misc.	99,000
Mainline pipe inland freight	6,459,000
Other pipe inland freight	12,000
Use tax	2,737,000
Pipeline construction	28,584,000
Other contracts	310,000
Construction use tax in Washington	1,092,000
Survey contract	104,000
Radiographic contract	430,000
Property damage payments	548,000
Right-of-way (est.)	653,555
Restoration	1,612,000
Line pack	554,000
Misc. (est.)	19,575,090
Total	$106,111,645
$/mile	$1,023,256

134.3 miles of 36-in. loop, Oregon

Item	Cost
Mainline coated pipe	$46,395,000
Valves	1,516,000
Misc. pipe and fittings	449,000
Casing, 42-in.	49,000
Valve shelters, pipeline markers, misc.	137,000
Mainline pipe inland freight	2,540,000
Other pipe inland freight	7,000
Pipeline construction	45,524,000
Other contracts	1,598,000
Survey contract	135,000
Radiographic contract	551,000
Property damage payments	709,000
Right-of-way (est.)	780,290
Restoration	2,087,000
Line pack	515,000
Blow gas	218,000
Misc. (est.)	23,371,020
Total	$126,581,310
$/mile	$934,827

34.3 miles of 12.75 in., Louisiana

Item	Cost
Line pipe 12.75 in. X 0.375-in. W.T. X 42	$4,165,400
Riser/fab pipe, 12.75 in. X 0.500-in. W.T. X42	36,000
Corrosion/weight coating	1,002,700
Cathodic protection	143,000
Valves and fittings	120,000
Install 34.3 miles of 12-in. pipe; 2 risers, 3 subsea tap assemblies	4,000,000
Survey	150,000
Engineering	200,000
Diving inspection	360,000
Inspection	230,000
Bond	40,000
Insurance	240,000
Misc. (est.)	1,903,900
Total	$12,591,000
$/mile	$367,085

4.9 miles of 6 in., Louisiana

Item	Cost
Line pipe 6.625 in. X 0.375-in. W.T. X42	$289,800
Riser/fab pipe, 6.625 in. X 0.432-in. W.T. X42	7,700
Corrosion/weight coating	37,100
Cathodic protection	20,000
Valves and fittings	50,000
Install 4.9 miles of 6-in. pipe, 1 riser, 1 subsea tie-in	1,700,000
Survey	16,500
Engineering	22,000
Diving inspection	75,000
Inspection	100,000
Bond	17,000
Insurance	53,000
Misc. (est.)	425,428
Total	$2,813,528
$/mile	$574,189

land-pipeline construction projects and 21 offshore for a total of 105, compared to 129 land and 3 offshore reported in last year's Pipeline Economics Report.

Land projects proposed during the period surveyed represent 2,025.78 miles of pipeline at an estimated price tag of more than $1.7 billion, and the offshore pipeline projects represent 386.59 miles of pipeline with an estimated price of just more than $285 million.

Total estimated costs for these projects, land and offshore, reach almost $2 billion.

Total costs of projects surveyed in last year's Pipeline Economics Report ran more than $3.6 billion divided between $3.3 billion for land and $303 million for offshore.

All projects proposed during the period covered (July 1, 1988, to June 30) represent 2,410.37 miles, a decrease over mileage proposed for the period immediately preceding of

0.25 miles of 20 in., Alabama ("Gateway")

Item	Cost
Right-of-way and cost of acquisition	$4,400
Pipe 20 in. OD X 0.375-in. W.T. 78.60# API 5L, X60	$26,500
20 in. OD X 0.500-in. W.T. 104.13# API 5L, X42	23,400
Coating material--enamel	6,700
Meter and regulator facilities	192,600
Miscellaneous material	94,100
Construction, equipment and labor	229,700
Engineering—surveying and mapping	700
Administrative and field engineering and inspection	67,000
General overhead	41,900
Interest	6,000
FERC fees (est.)	1,666
Total	$694,666
$/mile	$2,778,664

57.5 miles of 20 in. replacement, Pennsylvania-New Jersey

Item	Cost
Materials	$11,099,800
Installation	24,874,000
Right-of-way and damages	6,422,700
Other costs	3,291,600
Allowance for funds used during construction (afudc)	949,200
General administration	2,463,600
Construction overheads	607,100
FERC fees (est.)	77,115
Total	$49,785,115
$/mile	$865,828

5,519.75 miles, or −56.3%.

Examination of proposed projects for the latest period reveals the extent to which U.S. natural-gas pipeline companies want to go after the anticipated heavy gas demand in the U.S. Northeast. Many projects reflect looping in Pennsylvania, New Jersey, and Connecticut.

By way of comparison, this year's report includes data on a major Canadian gas-transmission system expansion project (map and table). By the same token, anticipated heavy gas demand in California EOR and electric-generating markets shows up in the Idaho-Washington projects.

And development of the large gas fields immediately offshore Alabama is reflected in the mileage proposed for that area.

Cost trends, components. Cost-per-mile figures may reveal more about cost trends than aggregate costs.

For proposed U.S. gas-pipeline projects in the 1988-89 period surveyed, the average land cost per mile was

Onshore pipeline projects (continued)

24.5 miles of 30 in., Alabama ("Gateway")

Item	Cost
Right-of-way and cost of acquisition	$601,100
Pipe	
30 in. OD X 0.328-in. W.T. 103.94# API 5L, X65	5,219,900
30 in. OD X 0.406-in. W.T. 128.32# API 5L, X65	426,200
30 in. OD X 0.500-in. W.T. 157.53# API 5L, X60	226,200
Coating material—enamel	770,200
Meter and regulator facilities	647,900
Miscellaneous material	1,587,400
Construction equipment and labor installation	5,056,000
Engineering: surveying and mapping	70,200
Administrative and field engineering and inspection	1,677,300
General overhead	1,058,300
Interest	911,300
FERC fee (est.)	43,904
Total	**$18,295,904**
$/mile	**$746,772**

8 miles of 36-in. loop, Pennsylvania

Item	Cost
Rights-of-way and damages	$256,000
Materials	
Pipe	
36 in. OD X 0.462-in. W.T. X65	997,170
36 in. OD X 0.554-in. W.T. X65	1,109,418
36 in. OD X 0.750-in. W.T. X65	479,797
Internal coating	117,886
External coating	367,533
Valves and fittings	524,750
Rock shield	115,000
Freight	199,640
Miscellaneous	297,848
Installation	
36-in. line	3,286,229
Bored crossings	204,000
Other installations	1,174,059
Surveys	120,000
Field engineering and supervision	416,670
Misc. (est.)	2,026,226
Total	**$11,692,226**
$/mile	**$1,461,528**

0.48 miles of 22-in. embayment crossing loop, Tennessee

Item	Cost
Right-of-way and damages	$8,000
Material	
22 in. OD X 0.375-in. W.T. X52 DSAW w/thin film epoxy and concrete coating	86,400
22 in. OD X 0.375-in. W.T. X52 DSAW wt/thin film epoxy coating	14,720
22 in. OD X 0.312-in. W.T. X52 DSAW w/thin film epoxy coating	33,440
Valve, 22-in. ball	112,000
Valve, 6-in. plug	21,000
Misc. material and sales tax	57,440
Installation	
Lay and bury	61,600
River crossing	720,000
Fabrication, road bore and misc. construction	64,000
Non-destructive testing	12,000
General supervision, engineering	50,000
Field inspection	62,400
Contingencies	65,000
Misc. (est.)	198,280
Total	**$1,566,280**
$/mile	**$3,263,083**

7.5 miles of 16 in., North Carolina

Item	Cost
Materials	$776,700
Installation costs	2,159,600
Rights-of-way, damages	185,700
Other costs	419,350
Allowance for funds used during construction (afudc)	49,700
General administration	195,900
Construction overheads	82,600
FERC fee (est.)	10,561
Total	**$3,880,111**
$/mile	**$517,348**

191 miles of 24 in., Oklahoma-Arkansas

Item	Cost
Mainline pipe	
24 in. X 0.312-in. W.T. X60	$31,713,000
24 in. X 0.375-in. W.T. X60	717,000
Valve assemblies	455,000
Trap assemblies	946,000
Other	1,801,000
Pipeline construction	31,588,000
Pipeline radiographic inspection	430,000
Right-of-way and damages	1,687,000
Surveys	230,000
Engineering, construction management	3,000,000
Contingency	3,754,000
Allowance for funds used during construction	3,272,000
FERC filing fee	19,500
Total	**$79,612,500**
$/mile	**416,819**

2 miles of 30-in. river crossing, Iowa-Illinois

Item	Cost
Company material	$1,087,200
Contract labor, materials	3,516,100
Supervision	250,000
Misc. company costs incl. FERC fee ($1,470)	275,000
Land and right-of-way	100,000
Contingency	248,900
Interest and overheads	522,800
Total	**$6,000,000**
$/mile	**$3,000,000**

$842,050/mile compared with $657,388/mile for the 1987-88 period, an increase of 28%.

For offshore projects, the 1988-89 figure was $737,474 compared with $755,345/mile for 1987-88, a decrease of 2.4%.

Combined land and offshore projects show an average cost of $825,278/mile for this year's coverage; for the 1987-88 period, the figure was $664,509/mile.

Analyses of the four major categories of pipeline construction costs—material, labor, right-of-way and damages, and miscellaneous—can also indicate trends within each group.

"Miscellaneous" generally includes engineering, supervision, contingencies, allowances for funds used during construction (afudc), administration and overheads, and FERC filing fees.

For the 105 projects surveyed for the 1988-89 period covered in this report, cost-per-mile data for the four categories are as follows:

- Material—Land, $309,938/mile; offshore, $308,167/mile; total, $309,654/mile.
- Labor—Land, $361,472/mile; offshore, $289,386/mile; total, $349,920/mile.
- R.O.W. and damages—Land, $33,330/mile; offshore, $1,372/mile; total, $28,209/mile.
- Miscellaneous—Land, $136,479/mile; offshore, $138,549/mile; total, $136,810/mile.

Table 3 lists proposed pipelines in order of increasing diameter and increasing lengths within each pipeline diameter.

The average cost per mile for the projects shows no clear-cut trend related to either length or geographic area.

In general, however, the cost per mile within a given diameter indicates that the longer the pipeline, the lower the incremental cost for construction.

Nonetheless, road, highway, and river crossings and marshy or rocky terrain each strongly affects pipeline construction costs.

Fig. 3, derived from Table 3 for land and offshore pipelines, shows the major cost-component split for pipeline construction cost.

Material and labor are shown to make up almost 80% of the cost of constructing land pipelines and almost 81% of the cost for offshore pipelines.

Fig. 4 plots the average pipeline construction cost for land and offshore gas-pipeline construction projects listed in Table 3.

Compressor stations. Compressor-

OFFSHORE PIPELINE PROJECTS

55.0 miles of 24 in., Alabama-Louisiana

Item	Cost
Route and environmental survey	$206,000
Right-of-way, damages, and permits	403,000
Material	
Pipe	
24 in. OD X 0.500-in. W.T. X52	13,433,000
24 in. OD X 0.688-in. W.T. X65	414,000
Coating	6,485,000
Other material	1,454,000
Installation	
Contract portion	16,952,000
Company portion	724,000
Contingency	2,003,000
Miscellaneous	3,143,832
Total	$45,217,832
$/mile	$822,142

9 miles of 12 in., Alabama

Item	Cost
Route and environmental survey	$42,000
Right-of-way, damages, and permits	2,000
Material	
Pipe	
12 in. OD X 0.406-in. W.T. X42	1,016,000
12 in. OD X 0.500-in. W.T. X42	30,000
Coating	568,000
Other material	193,000
Installation	
Contract portion	2,528,000
Company portion	145,000
Contingency	227,000
Misc. (est.)	354,900
Total	$5,105,900
$/mile	$567,322

station costs make up another major cost element of natural-gas pipelines. Table 6 lists 44 land and 2 offshore compressor-station projects. FERC applications for these projects cover the same period as for pipelines: July 1, 1988, to June 30.

Costs for new land compressor stations range from a low of $551/hp for a 12,600-hp station in Connecticut to a high of $4,181/hp for a 2,700-hp station in New York. Cost-per-horsepower figures show no particular correlation with compressor-station size or location.

ONSHORE COMPRESSOR PROJECTS

Install 4,000 hp, Alabama

Item	Cost
Land	$450,000
Site improvements	50,000
Other structures	217,000
Compressor station equipment	
Main compressor	1,850,000
Spare parts	450,000
Major gas piping	253,000
Station electrical system	582,000
Instrumentation	170,000
Other equipment	875,000
Installation	
Structures	974,000
Main compressor	653,000
Major gas piping	653,000
Station electrical system	155,000
Instrumentation	58,000
Other equipment	676,000
Contingency	404,000
Misc. (est.)	633,151
Total	$9,103,151
$/hp	$2,277

Add 12,600 hp, Pennsylvania

Item	Cost
Material	
Structures	$150,000
Yard improvements, structures	29,000
Station piping	748,000
Main compressor units	4,095,000
Electrical equipment	56,000
Other equipment	262,000
Concrete	36,000
Contractor's overhead	3,000
Field engineering, supervision	87,500
Installation	
Structures	50,000
Yard improvements, structures	81,000
Station piping	748,000
Main compressor units	315,000
Electrical equipment	45,000
Other equipment	112,500
Concrete	72,000
Contractor's overhead	6,000
Field engineering, supervision	300,000
Other miscellaneous	1,507,975
Total	$8,703,975
$/hp	691

Install 16,000 hp, South Dakota

Item	Cost
Material	$8,984,000
Labor	2,644,000
Engineering	891,000
Company supervision	1,256,000
Contingencies	1,252,000
Interest and overheads (est.)	1,038,000
Filing fees (est.)	18,900
Total	$16,083,900
$/hp	$1,005

Add 12,600 hp, Pennsylvania

Item	Cost
Material	
Structures	$150,000
Yard improvements, structures	29,000
Station piping	748,000
Main compressor units	4,095,000
Electrical equipment	56,000
Other equipment	262,000
Concrete	36,000
Contractor's overhead	3,000
Field engineering, supervision	87,500
Installation	
Structures	50,000
Yard improvements, structures	81,000
Station piping	748,000
Main compressor units	315,000
Electrical equipment	45,000
Other equipment	112,500
Concrete	72,000
Contractor's overhead	6,000
Field engineering, supervision	300,000
Misc. (est.)	1,295,146
Total	$8,491,146
$/hp	$674

Fig. 5 shows the cost split for land compressor stations based on data in Table 6.

Effect of size. Another element affecting the capital expenditures for pipeline construction is the distribution of the diameter and mileage.

Fig. 6's curves reflect the cumulative percentage of mileage for pipeline diameters of 3 in. to 42 in. for July 1, 1987, to June 30, 1988, and for 2 in. to 48 in. for July 1, 1988, to June 30.

For the 1987-88 period, 71% of the construction proposed was for diameters of 24, 26, 30, 36, and 42 in. A similar distribution pattern was evident for the more recent period in which diameters of 24, 30, and 36 in. occupied more than 65% of the proposed construction.

As an aid in determining the detailed costs for each major element in pipeline and compressor-station construction for the pipelines and compressor stations, several tables covering specific projects are included in this report.

These give detailed cost breakdowns for each major component in a construction-cost estimate.

They cover cost information from the FERC applications for the 1988-89 period surveyed and listed in Table 3.

These detailed tables represent both a variety of land geographic locations in the U.S. and pipeline and compressor stations for both land and offshore facilities.

Operating costs. Once a natural-

OFFSHORE COMPRESSOR PROJECTS

Install 11,000 hp, Mississippi

Item	Cost
Material	
Structures	$84,000
Yard improvements, structures	12,000
Station piping	526,000
Main compressor units	3,350,000
Electrical equipment	62,000
Other equipment	281,500
Concrete	40,000
Contractor's overhead	10,000
Field engineering, supervision	85,000
Installation	
Structures	56,000
Yard improvements, structures	31,000
Station piping	651,000
Main compressor units	335,000
Electrical equipment	30,000
Other equipment	86,500
Concrete	60,000
Contractor's overhead	2,000
Field engineering, supervision	125,000
Misc. (est.)	1,128,198
Total	$7,155,198
$/hp	$650

Install 1,200 hp, Alabama

Item	Cost
Material	
Structures	$125,500
Yard improvements, structures	53,000
Station piping	426,000
Main compressor units	700,000
Electrical equipment	46,000
Other equipment	367,500
Concrete	30,000
Contractor's overhead	10,000
Field engineering, supervision	49,000
Installation	
Structures	72,500
Yard improvements, structures	79,000
Station piping	451,000
Main compressor units	70,000
Electrical equipment	32,000
Other equipment	93,500
Concrete	35,000
Contractor's overhead	2,000
Field engineering, supervision	190,000
Misc. (est.)	527,910
Total	$3,349,910
$/hp	$2,792

gas pipeline is laid and compressor stations constructed, operating costs become the next consideration.

As an aid in estimating this element, transmission expenses for interstate gas pipelines for 1986 and 1987 have been included (Table 7).

Its data are based on 253,656 miles of pipeline operated and 7.8 tcf of gas sold for 1986 majors and on 248,458 miles of pipeline operated and 6.5 tcf of gas sold for 1987 majors.

- The highest component of transmission-operating expenses is transmission and compression of gas by others: for majors in 1986, this component was $4,996/mile or $162/MMcf; for majors in 1987, this component was $4,222/mile or $162/MMcf.
- The second highest cost component of transmission-operating expense is gas for compressor-station fuel: for majors in 1986, $2,100/mile or $68/MMcf; for majors in 1987, $1,479/mile or $57/MMcf.
- The highest cost component of maintenance expense covers compressor-station equipment: for majors in 1986, $780/mile or $25/MMcf; for majors in 1987, $794/mile or $30/MMcf.
- The second highest cost component for maintenance is the maintenance of pipelines: for 1986 majors, $369/mile or $12/MMcf; for majors in 1987, $366/mile or $14/MMcf.
- Table 7 indicates that the highest component of transmission expenses for natural-gas pipelines is the operation expense: for 1986 majors, $10,239/mile or $332/MMcf; for 1987 majors, $8,961/mile or 344/MMcf.
- Unit-maintenance expenses for 1986 majors were $1,527/mile or $59/MMcf; for 1987 majors, $1,495/mile or $402/MMcf.
- During 1986, major natural-gas pipeline companies spent almost $2.6 billion for operation expenses and nearly $390 million on maintenance. Total expenditures by 1986 majors for operation and maintenance expenses reached almost $3 billion.

Total operation expenses for majors in 1987 fell to slightly more than $2.2 billion, a drop of more than $370 million (off a sharp 14.3%). This follows a similarly sharp 14.8% drop from 1985 to 1986 noted in last year's report. Operation costs for the 3-year period 1985 through 1987 have dropped by 27%.

Total maintenance expenses in 1987 fell to slightly more than $371 million from a 1986 cost of $386 million, a decrease of almost $16 million (4%).

Total transmission expenses showed a decline between 1986 and 1987. In the latter year, they reached slightly less than $2.6 billion, a drop from 1986 of a little more than $386 million (down a noticeable 13%).

- On a unit basis, the total 1986 transmission expense for majors was $11,766/mile or $382/MMcf of gas sold; for 1987 majors, $10,457/mile or $402/MMcf. ▪

LIQUID PIPELINES

	Miles of pipeline				Deliveries, 1,000 bbl			Total trunkline traffic Million bbl-miles			Fiscal data, $1,000			
		Trunk												
COMPANY	Gathering	Crude	Products	Total	Crude	Products	Total	Crude	Products	Total	Carrier property	Change	Operating revenue	Income
Acorn Pipeline Co.	—	—	—	—	—	—	—	—	—	—	−3,388	—	—	−173
Airforce Pipeline Inc.	—	—	5	5	—	1,572	1,572		7	7	353	—	275	76
Algonquin Pipe Line Co.	33	51	—	84	650	—	650	22	—	22	2,360	15	539	102
All American Pipeline Co.(new)	—	1,108	—	1,108	26,256	—	26,256	29,091	—	29,091	1,443,503	226,162	—	—
Allegheny Pipeline Co.	—	—	603	603	—	10,491	10,491		3,547	3,547	29,051	653	6,035	1,673
Amerada Hess Pipeline Co.	—	* 819	—	* 819	11,510	—	11,510	8,919	—	8,919	149,608	63	35,889	13,938
American Petrofina Pipeline Co.	—	1,104	—	1,104	27,539	—	27,539	1,302	—	1,302	26,294	5,192	8,856	1,597
Amoco Pipeline Co.	2,227	7,703	2,367	12,297	343,593	160,535	504,128	113,055	10,309	123,364	584,840	17,147	207,360	102,377
Antelope Pipe Line Co.(new)	—	—	—	—	1330	—	1330	115	—	115	—	—	365	49
ARCO Pipe Line Co.	1,610	*2,398	2,831	*6,839	403,694	142,222	545,916	155,744	10,371	166,115	2,412,291	−1,667	612,864	217,588
Ashland Pipe Line Co.	501	787	—	1,288	95,845	—	95,845	66,394	—	66,394	101,710	2,265	43,384	15,709
Atlantic Pipeline Co.	—	11	929	940	48,043	51,141	99,184	—	8,274	8,274	52,996	4,327	36,324	8,088
ATTCO NGL Pipeline Co.	—	—	27	27	—	142	142	—	3	3	225	—	36	−40
Badger Pipe Line Co.	—	—	331	331	—	59,610	59,610	—	—	—	25,685	306	11,848	3,299
Belle Fourche Pipeline Co.	1,253	728	—	1,981	26,240	—	26,240	2,483	—	2,483	57,700	1,570	14,680	5,217

LIQUID PIPELINES (continued)

COMPANY	Miles of pipeline Gathering	Trunk Crude	Trunk Products	Total	Deliveries, 1,000 bbl Crude	Products	Total	Total trunkline traffic Million bbl-miles Crude	Products	Total	Fiscal data, $1,000 Carrier property	Change	Operating revenue	Income
Black Lake Pipe Line Co.	—	255	—	255	2,745	—	2,745	469	—	469	10,563	174	1,541	69
Buccaneer Pipe Line Co.	—	2	—	2	289	—	289	—	—	—	176	—	43	-190
Buckeye Pipe Line Co. L. P.	—	—	3,390	3,390	—	284,536	284,536	—	35,911	35,911	468,814	2,937	134,450	26,073
Buckeye Pipe Line Co. of Mich L P	—	160	4	164	11,143	7,436	18,579	1,210	183	1,393	41,358	557	3,748	-2,097
Butte Pipe Line Co.	—	373	—	373	33,490	—	33,490	7,918	—	7,918	19,039	331	9,591	2,211
C & T Pipeline Inc.	—	—	62	62	—	89	89	—	59	59	350	—	145	668
Calnev Pipe Line Co.	—	—	583	583	—	29,104	29,104	—	5,707	5,707	42,298	2,695	20,293	10,041
Chaparral Pipeline (NGL) Co.	—	—	940	940	—	39,951	39,951	—	19,569	19,569	97,423	4,222	22,604	75,42
Chase Transportation Co.	—	—	716	716	—	14,060	14,060	—	4,733	4,733	38,604	22	8,299	4,699
Chevron Pipe Line Co.	2,006	2,739	3,385	8,130	338,132	247,955	586,087	23,217	74,384	97,601	608,665	89,228	197,151	81,950
Chicap Pipe Line Co.	—	235	—	235	76,384	—	76,384	5,499	—	5,499	33,300	12	6,201	2,178
Chisholm Pipeline Co.	—	—	203	203	—	11,288	11,288	—	2,291	2,291	19,727	26	4,150	1,086
Ciniza Pipe Line Inc.	233	135	11	379	6,823	1,590	8,413	439	18	457	6,858	148	3,013	-266
Citgo Pipeline Co.	602	847	3	1,452	106,731	3,231	109,962	3,071	3	3,074	42,479	-2,929	16,125	2,643
CKB Petroleum Inc.	—	—	—	—	1,051	—	1,051	54	—	54	4,757	—	2,892	493
Clarco Pipe Line Co.	90	—	—	90	1,235	—	1,235	—	—	—	3,624	6	340	-51
CNG Pipeline Co.	—	—	—	—	1,407	—	1,407	—	—	—	4,144	—	1,652	708
Coastal Pipeline Co.	—	—	8	8	—	14,321	14,321	—	1,065	1,065	6,608	—	2,657	696
Cochin Pipeline System	—	—	1,197	1,197	—	22,959	22,959	—	20,370	20,370	240,592	485	54,033	32,140
Collins Pipeline Co.	—	—	124	124	—	41,629	41,629	—	5,162	5,162	15,344	—	3,330	252
Colonial Pipeline Co.	—	—	5,274	5,274	—	635,620	635,620	—	658,014	658,014	1,367,578	20,971	500,464	157,057
Conoco Pipe Line Co.	4,103	1,654	2,138	7,895	202,159	59,371	261,530	15,316	9,950	25,266	2,340,05	37,518	84,080	38,222
Conquest Exploration Corp.	—	—	—	—	4	—	4	—	—	—	300	—	29	-300
Cook Inlet Pipe Line Co.	—	55	—	55	10,869	—	10,869	349	—	349	42,491	45	12,369	3,783
Crown-Rancho Pipe Line Corp.	—	—	—	—	7,816	—	7,816	2,772	—	2,772	2,129	-100	2,510	1,871
Diamond Shamrock Refg & Markt Co.	—	—	622	622	—	15,100	15,100	—	7,391	7,391	34,314	-24	12,697	5,387
Dixie Pipeline Co.	—	—	1,303	1,303	—	34,761	34,761	—	19,211	19,211	77,084	1,510	45,478	13,794
Dome Pipeline Corp.	1	8	134	143	—	9,685	9,685	—	196	196	22,746	31	1,677	14,796
Emerald Pipe Line Corp.	—	—	113	113	—	2,161	2,161	—	184	184	1,430	—	585	153
Endicott Pipeline Co.	—	25	—	25	37,929	—	37,929	946	—	946	55,585	959	26,929	12,984
Enron Liquids Pipeline Co.	—	—	1,581	1,581	—	51,587	51,587	—	16,291	16,291	162,248	973	40,977	8,388
Enterprise Pipeline Co.	—	—	98	98	—	6048	6048	—	592	592	20,435	44	· 4,686	1,775
Enterprise Products Co. of Miss.	—	—	125	125	—	2,126	2,126	—	265	265	12,136	—	642	2,768
EPC Partners Ltd. (new)	—	—	268	268	—	7,080	7,080	—	1,897	1,897	36,964	140	3,358	3,509
Eureka Pipe Line Co., The	771	3	3	777	2,369	—	2,369	1	—	1	16,194	281	7,159	1,739
Explorer Pipeline Co.	—	—	1,397	1,397	—	174,142	174,142	—	129,220	129,220	256,560	1,037	107,639	36,365
Exxon Pipeline Co.	1,884	* 4,936	2,558	* 9,378	428,040	99,888	527,928	162,185	8,206	170,391	2,185,522	5,922	602,167	304,700
Farmland Industries Inc.	627	239	—	866	23,211	—	23,211	666	—	666	11,582	563	3,576	—
Four Corners Pipe Line Co.	281	1,183	14	1,478	111,710	—	111,710	14,651	—	14,651	159,603	3,862	39,636	7,557
Frontier Pipeline Co.	—	290	—	290	452	—	452	131	—	131	48,849	—	1,208	—
G & T Pipeline Co.	—	30	—	30	98	—	98	2	—	2	5,142	—	573	126
Gulf Central Pipeline Co.	—	—	1,975	1,975	—	10,436	10,436	—	7,179	7,179	69,791	589	20,162	7,893
Hess Pipeline Co.	—	442	—	442	29,651	—	29,651	1,842	—	1,842	45,454	163	12,741	3,371
Howell Crude Oil Co.†														
Interstate Storage & Pipeline Co.	—	—	23	23	—	1,950	1,950	—	—	—	3,167	—	1,310	399
Jayhawk Pipeline Corp.	821	657	—	1478	42272	—	42272	4229	—	4229	27179	2022	10878	2519
Kaneb Pipe Line Co.	—	—	2080	2080	—	54602	54602	—	13393	13393	107351	1846	37923	11456
Kerr-McGee Pipeline Corp.	8	56	—	64	1439	—	1439	34	—	34	5572	244	1922	2330
Kiantone Pipeline Corp.	—	78	—	78	20,540	—	20,540	20	—	20	10,407	1,641	4,313	-170
Koch Pipelines Inc.	1,016	1,125	1,185	3,326	48,060	55,382	103,442	2,391	25,344	27,735	300,059	10,311	57,945	19,190
Kuparak Transportation Co.	—	37	—	37	110,464	—	110,464	3,624	—	3,624	126,148	—	68,411	54,950
Lake Charles Pipe Line Co.	—	—	13	13	—	90,560	90,560	—	454	454	10,938	43	4,528	1,872
Lakehead Pipe Line Co. Inc.	—	2,615	—	2,615	473,074	—	473,074	366,739	—	366,739	537,718	27,449	216,492	59,077
Largo Co., The	—	—	—	—	961	—	961	38	—	38	12,654	14	1,974	712
Laurel Pipe Line Co.	—	—	351	351	—	33,694	33,694	—	5,220	5,220	46,979	825	14,372	3,514
Locap Inc.	—	59	—	59	228,708	—	228,708	13	—	13	120,511	155	20,545	2,368
Marathon Pipe Line Co.	1,018	1,726	1,466	4,210	356,132	238,129	594,261	53,855	18,166	72,021	361,501	10,601	144,706	46,999
Mark Oil Pipeline Co.	1	—	—	1	272	—	272	—	—	—	922	—	190	-60
McMoRan Pipeline Co.	—	—	—	—	126	—	126	11	—	11	1,760	—	314	22

LIQUID PIPELINES (continued)

COMPANY	Miles of pipeline				Deliveries, 1,000 bbl			Total trunkline traffic Million bbl-miles			Fiscal data, $1,000			
	Gathering	Trunk Crude	Trunk Products	Total	Crude	Products	Total	Crude	Products	Total	Carrier property	Change	Operating revenue	Income
Meridan Oil Frontera Inc.	—	—	—	—	354	—	354	38	—	38	1,378	—	674	266
Mesa Transmission Co	—	11	—	11	880	—	880	47	—	47	10,569	—	1,612	313
Mid-America Pipeline Co.	—	19	§8,081	§8,100	31,467	162,909	194,376	4,163	55,971	60,134	474,083	-1,289	152,294	45,475
Mid-Valley Pipe Line Co.	—	95	—	95	126,588	—	126,588	68,366	—	68,366	100,342	805	44,297	13,294
Midland-Lea Inc., (final)	—	101	275	376	—	—	—	—	—	—	20,325	—	—	—
Milne Point Pipe Line Co.	11	—	—	11	—	—	—	—	—	—	26,930	45	—	-956
Minnesota Pipe Line Co.	—	509	—	509	80,265	—	80,265	20,467	—	20,467	76,162	16,144	27,290	6,888
Mitco Pipeline Co.	9	—	—	9	—	—	—	—	—	—	2,104	—	46	-146
Mobil Alaska Pipeline Co.	—	* 818	—	* 818	29,966	—	29,966	23,849	—	23,849	398,440	140	91,641	50,016
Mobil Eugene Island Pipeline Co.	—	134	—	134	20,551	—	20,551	1,629	—	1,629	46,965	2,848	18,305	9,415
Mobil Pipe Line Co.	3,347	4,597	1,739	9,683	195,651	107,655	303,306	66,505	12,134	78,639	307,869	4,012	160,536	82,961
National Transit Co.	186	—	—	186	413	—	413	—	—	—	3,619	57	1,059	605
Navajo Pipeline Co.	—	70	323	393	—	5,788	5,788	—	1221	1221	8,556	27	6,077	2,946
Northern Rockies Pipe Line Co.	—	77	—	77	612	—	612	47	—	47	1,048	—	152	1,423
NW Pipeline Co.	—	—	—	—	2,552	—	2,552	260	—	260	6,386	—	2,603	1,865
Ohio Oil Gathering Corp.	731	—	—	731	3,980	—	3,980	—	—	—	9,904	685	7,837	240
Ohio River Pipe Line Co.	—	—	400	400	—	16,113	16,113	—	2,012	2,012	25,957	2,853	8,256	2,553
Oiltanking Pipeline Inc.	—	13	15	28	50,997	52	51,049	623	1	624	16,016	4,709	4,961	2,042
Olympic Pipe Line Co.	—	—	391	391	—	93,049	93,049	—	16,971	16,971	61,640	1,144	28,289	7,822
Osage Pipe Line Co.	—	136	—	136	30,492	—	30,492	4,073	—	4,073	19,531	18	5,814	1,768
Owensboro-Ashland Co.	—	266	—	266	71,501	—	71,501	18,977	—	18,977	44,692	178	11,973	2,468
Oxy NGL Pipeline Co.	—	—	106	106	—	5,847	5,847	—	623	623	3,249	19	1,531	671
Oxy Pipeline Inc.	—	—	—	—	605	—	605	38	—	38	5,125	292	947	-279
Paloma Pipe Line Co.	—	—	—	—	21,034	—	21,034	1,309	—	1,309	5,783	20	2,727	882
Pennzoil Offshore Pipeline Co.	—	4	—	4	515	—	515	14	—	14	4,025	560	412	46
Permian Operating L P														
Plantex Pipeline Co. (new)	—	—	27	27	—	125	125	—	3	3	2,521	2,521	169	70
Phillips Alaska Pipeline Corp.	—	*818	—	* 818	11788	—	11,788	8,032	—	8,032	126,915	68	32,493	15,579
Phillips Pipe Line Co.	1,095	855	4,100	6,050	75,727	222,775	298,502	14,232	48,743	62,975	380,103	32,422	160,365	54,764
Pioneer Pipe Line Co.	—	—	299	299	—	12,185	12,185	—	2,826	2,826	13,725	318	6,779	1,695
PL Pipeline Co.	—	—	—	—	60	—	60	7	—	7	1,039	—	112	-32
Plantation Pipe Line Co.	—	—	3146	3146	—	189,167	189,167	—	118,068	118,068	303,506	406	116,931	13,670
Platte Pipe Line Co.	—	1283	—	1,283	39,296	—	39,296	27,993	—	27,993	80,009	470	26,552	10,138
Pogo Offshore Pipeline Co.	—	—	—	—	1,571	—	1,571	206	—	206	1,330	-7,942	1,065	7,091
Point Arguello Pipeline Co. (new)														
Point Pedernales Pipeline Co.	—	46	—	46	6,219	—	6,219	143	—	143	50,216	-106	16,854	4,685
Polysar Hydrocarbons Inc. (new)														
Portal Pipe Line Co.	294	614	—	908	20,810	—	20,810	7,567	—	7,567	44,527	180	13,733	3,185
Portland Pipe Line Corp.	—	177	—	177	23,813	—	23,813	4,074	—	4074	42,064	67	14,579	4,712
Samedan Pipeline Corp. (new)														
Seminole Pipeline Co.	106	—	634	740	—	49,276	49,276	—	23,443	23,443	204,784	1,990	31,114	12,897
Shamrock Pipe Line Corp., The	649	318	580	1,547	43,840	24,978	68,818	3,187	3,115	6,302	35,187	261	17,789	1,636
Shell Pipe Line Corp.	2,059	4,745	431	7,235	414,567	117,785	532,352	108,789	5,025	113,814	475,988	9,579	163,625	70,062
Sohio Alaska Pipeline Co.	—	* 818	—	* 818	380,878	—	380,878	294,321	—	294,321	4,902,519	2,081	1,175,716	482,913
Sohio Pipe Line Co.	1,101	547	277	1,925	182,648	98,099	280,747	48,478	11,284	59,762	108,306	-79	83,216	16,975
Sonat Oil Transmission Inc.	—	42	—	42	950	—	950	9	—	9	5553	—	745	622
Southcap Pipe Line Co.	—	—	—	—	43,658	—	43,658	25,490	—	25,490	51,961	50	11,037	3,040
Southern Pacific Pipe Line L.P.	—	—	3,174	3,174	—	317,733	317,733	—	40,324	40,324	446,678	84,667	139,920	61,199
Sun Oil Line Co of Michigan	—	201	—	201	13,754	—	13,754	2,764	—	2,764	668	—	5,387	1,613
Sun Pipe Line Co.	379	441	1,758	2,578	85,241	124,722	209,963	3,087	11,746	14,833	150,193	5,842	65,954	7,810
Tecumseh Pipe Line Co.	—	205	—	205	19,539	—	19,539	701	—	701	15,270	—	4,085	1,658
Texaco Pipeline Inc.	2,075	3,216	984	6,275	360,598	121,551	482,149	66,700	4,655	71,355	446,998	19,942	123,220	26,758
Texas Eastern Products Pipeline Co.	—	—	3,373	3,373	—	156,926	156,926	—	83,981	83,981	449,841	8,675	125,996	32,151
Texas-New Mexico Pipe Line Co.	1735	2184	—	3,919	119,168	—	119,168	15,558	—	15,558	92,808	2,579	32,207	11,652
Total Pipeline Corp.	193	605	97	895	73,668	17,356	91,024	9,100	1,470	10,570	54,211	3,716	13,845	-209
Trans Mountain Oil Pipeline Corp.	—	64	—	64	3,519	—	3,519	184	—	184	6,756	33	1,185	-2,050
Trans-Ohio Pipeline Co.	—	—	133	133	—	10,685	10,685	—	441	441	13,935	92	3,049	1,362

LIQUID PIPELINES (continued)

COMPANY	Miles of pipeline				Deliveries, 1,000 bbl			Total trunkline traffic, Million bbl-miles			Fiscal data, $1,000			
	Gathering	Trunk Crude	Trunk Products	Total	Crude	Products	Total	Crude	Products	Total	Carrier property	Change	Operating revenue	Income
Transco Terminal Co.	—	—	—	—	458	—	458	—	—	—	3,271	—	366	39
Unocal Pipeline Co.	693	* 1,528	16	* 2,237	85,725	17,459	103,184	20,497	206	20,703	199,174	-19,790	56,818	22,711
West Emerald Pipeline Corp.	—	—	296	296	—	2,578	2,578	—	562	562	1,947	26	1,180	152
West Shore Pipe Line Co.	—	—	321	321	—	71,622	71,622	—	8,537	8,537	35,257	339	18,845	5,790
West Texas Gulf Pipe Line Co.	—	579	—	579	115,447	—	115,447	47,336	—	47,336	47,167	647	28,937	12,055
Western Oil Transportation	548	—	—	548	11,786	—	11,786	—	—	—	29,735	98	6,040	-14,665
Whiskey Springs Oil Pipeline Co.	7	—	—	7	189	—	189	—	—	—	605	605	45	30
White Shoal Pipeline Corp.	7	—	—	7	2,823	—	2,823	125	—	125	2,619	1	289	—
Williams Pipe Line Co.	—	—	6,780	6,780	2,718	173,576	176,294	1,665	49,804	51,469	559,997	14,073	137,803	9,864
Wolverine Pipe Line Co.	—	—	621	621	—	84,632	84,632	—	11,383	11,383	72,691	148	26,735	10,944
Wyco Pipe Line Co.	—	—	677	677	—	19,935	19,935	—	3,404	3,404	28,789	1,642	14,844	5,547
Yellowstone Pipe Line Co.	—	—	752	752	—	23,517	23,517	—	8,131	8,131	29,585	327	15,103	3,997
1988 Totals	**34,311**	**55,900**	**80,246**	**170,457**	**6,509,367**	**4,974,279**	**11,483,646**	**1,969,467**	**1,649,223**	**3,618,690**	**24,331,493**	**678,817**	**6,861,938**	**2,504,966**
1987 Totals	35,055	54,886	77,924	167,865	6,277,670	4,916,665	11,194,335	1,931,768	§1,591,770	§3,523,539	§21,352,565	§415,253	§7,057,264	§2,475,411

Source: U.S. FERC Form No. 6's: Annual Report of Oil Pipelines, Dec. 31, 1988.

* Mileage represents Trans-Alaska pipeline and is included in total only once to avoid duplication. † Includes 1,097 miles of ammonia pipeline.

§ Revised from initial publication.

GAS PIPELINES

Company	Miles of pipeline				Total compressor stations			Volumes, MMcf		Fiscal data, $1,000			
	Transmission	Field	Storage	Total	Transmission	Other	Total	Sold	Trans. for others	Gas plant	Additions	Operating revenues	Net income
Alabama-Tennessee Natural Gas Co.	316	—	—	316	2	—	2	22,332	11,398	21,471	252	66,431	3,098
Algonquin Gas Transmission Co.*	983	—	—	983	5	—	5	155,225	35,968	363,760	22,840	531,917	16,264
Algonquin LNG Inc.		—	—	—	—	—	—	—	—	21,974	71	4,165	625
American Distribution Co.	38	—	—	38	—	—	—	—	767	4,765	2	1,959	577
ANR Pipeline Co. *	8,697	2,641	196	11,534	45	45	90	188,087	922,822	2,528,573	38,522	1,282,294	165,116
ANR Storage Co.	—	—	24	24	—	3	3	—	—	121,376	215	33,795	13,528
Arkansas Oklahoma Gas Corp.	360	174	—	534	5	—	5	12,639	9,826	61,047	5,424	42,933	3,374
Arkansas Western Gas Co.	1,296	360	—	1,656	5	—	5	21,631	3,167	133,202		88,360	702
Arkla Inc.*	6,292	3,598	66	9,956	23	143	166	242,026	347,113	2,119,698	778,081	1,339,299	104,224
Bayou Interstate Pipeline System	2	—	—	2	—	—	—	894	—	42	—	1,709	-29
Bear Creek Storage Co.	—	—	25	25	—	1	1	—	—	143,746	-641	47,915	13,860
Black Marlin Pipeline Co.	66	—	—	66	—	—	—	—	52,217	22,221	388	3,025	995
Blue Dolphin Pipe Line Co.	49	—	—	49	—	—	—	—	15,813	7,669	—	1,092	-484
Bluefield Gas Co.	32	—	—	32	—	—	—	959	—	2,370	135	4,374	143
Boundary Gas Inc.	—	—	—	—	—	—	—	32,317	—	—	—	74,391	—
Canyon Creek Compression Co.	—	—	—	—	1	—	1	—	40,013	22,232	11	7,889	1,078
Caprock Pipeline Co.	39	14	—	53	2	2	4	99	14,094	4,379	584	1,046	181
Carnegie Natural Gas Co.	216	875	—	1,091	7	7	14	14,213	2,162	75,141	4,441	47,346	640
Chandeleur Pipe Line Co.	174	—	—	174	—	—	—	—	28,285	20,865	232	930	-371
Cimarron Transmission Co.	—	41	—	41	—	—	—	2,686	289	1,531	80	4,219	14
CNG Transmission Corp. *	3,641	4,109	517	8,267	44	23	67	220,707	271,664	1,286,643	125,643	1,042,293	61,557
Colorado Interstate Gas Co. *	2,998	3,043	57	6,098	26	36	62	113,893	311,537	726,204	15,869	430,543	67,125
Columbia Gas Transmission Corp. *	10,950	6,647	1,207	18,804	111	71	182	390,563	610,726	2,002,128	57,340	1,906,141	-146,407
Columbia Gulf Transmission Co. *	4,269	—	—	4,269	13	22	35	—	833,060	1,080,801	23,895	129,161	12,592
Columbia LNG Corp.	88	—	—	88	—	—	—	—	1,611	201,957	—	12,229	856
Consolidated System LNG Co.	—	—	—	—	—	—	—	—	—	—	—	15,427	4,408
Distrigas of Mass. Corp.	—	—	—	—	—	—	—	15,252	—	49,113	3	50,727	15,744
East Tennessee Natural Gas Co. *	1,091	—	—	1,091	15	1	16	92,276	154	143,470	8,332	261,594	4,250
Eastern Shore Natural Gas Co.	—	—	—	—	—	—	—	7,638	3,496	14,965	687	24,481	921

GAS PIPELINES (continued)

	Miles of pipeline				Total compressor stations			Volumes, MMcf		Fiscal data, $1,000			
Company	Transmission	Field	Storage	Total	Transmission	Other	Total	Sold	Trans. for others	Gas plant	Additions	Operating revenues	Net income
El Paso Natural Gas Co. *	10,765	10,926	18	21,709	88	12	100	186,401	1,121,964	2,557,466	78,988	1,041,722	9,399
Enserch Corp.	8,283	2,300	—	10,583	45	—	45	206,371	275,920	1,214,537	62,565	1,055,712	-166,443
Equitable Gas Co.	—	—	—	—	—	—	—	53,358	3,979	397,223	-194,318	276,021	48,960
Equitrans Inc.	545	1,485	135	2,165	6	20	26	31,901	11,742	197,114	2,604	128,432	4,688
Florida Gas Transmission Co. *	4,426	—	—	4,426	19	25	44	236,165	25,781	564,559	35,554	555,153	131
Freeport Interstate Pipeline Co.	9	—	—	9	—	—	—	—	911	—	—	25	2
Gas Gathering Corp.	—	31	—	31	—	—	—	—	2,750	1,589	3	249	22
Gas Transport Inc.	41	68	—	109	—	—	—	1,629	—	3,825	—	4,928	-56
Gasdel Pipeline System Inc.	159	—	—	159	—	—	—	—	13,225	14,774	-97	3,394	735
Glacier Gas Co.	34	3	—	37	1	—	1	294	—	2,334	—	355	27
Granite State Gas Transmission Inc.	105	—	—	105	1	—	1	37,323	435	9,955	620	112,353	696
Great Lakes Gas Transmission Co. *	1,321	—	—	1,321	14	—	14	69,821	466,864	544,711	7,336	280,325	32,305
Great Plains Natural Co.	65	—	—	65	—	—	—	4,641	—	15,767	622	16,587	714
Hampshire Gas Co.	—	18	—	18	—	1	1	—	—	8,831	57	2,568	638
High Island Offshore System *	203	—	—	203	1	—	1	—	519,978	363,720	414	63,237	13,828
Honeoye Storage Co.	11	19	—	30	—	1	1	49	—	8,766	17	2,099	339
Indiana Utilities Corp.	21	—	—	21	—	—	—	377	—	2,308	420	1,780	155
Inland Gas Co., The	128	394	—	522	—	5	5	5,201	1	23,179	16	18,111	-330
Inter-City Minnesota Pipelines Ltd.	66	—	—	66	—	—	—	8,074	3,160	3,494	15	18,351	-46
Interstate Power Co.	—	—	—	—	—	—	—	17,838	10,109	40,760	2,469	274,321	23,010
Iowa-Illinois Gas and Electric Co.	—	—	—	—	—	—	—	48,922	15,123	189,784	6,964	496,374	58,426
Jupiter Energy Corp.	27	—	—	27	—	—	—	—	9,333	2,441	16	298	127
K N Energy Inc. *	9,296	2,913	24	12,233	26	73	99	82,293	15,653	444,728	21,413	307,623	15,549
Kentucky West Virginia Gas Co.	108	2,078	—	2,186	9	3	12	15,676	10,779	77,190	7,874	64,553	8,459
Lawrenceburg Gas Transmission Corp.	6	—	—	6	—	—	—	532	2,640	434	-41	2,962	58
Louisiana-Nevada Transit Co.	78	—	—	78	—	—	—	3,221	23	2,669	145	4,894	611
Lone Star Gathering Co.	39	7	—	46	—	—	—	—	376	1,656	7	393	88
Michigan Consolidated Gas Co.*	2,259	122	112	2,493	67	8	75	207,784	125,044	1,514,257	76,521	1,197,639	49,406
Michigan Gas Storage Co. *	563	—	148	711	1	1	2	3,177	102,810	54,353	860	108,980	1,984
Mid Louisiana Gas Co.	413	464	—	877	—	—	—	19,566	1,503	89,029	6,154	52,576	9,050
Midwestern Gas Transmission Co. *	903	—	—	903	15	—	15	115,514	2,174	171,086	2,965	386,796	937
MIGC Inc.	171	10	—	181	3	2	5	2,676	14,196	13,811	684	9,373	-1,498
Miss. River Tranmission Corp. *	2,018	145	74	2,237	—	20	20	159,787	1,039	432,184	15,533	446,591	19,635
Mitco Pipeline Co.	—	9	—	9	—	—	—	—	320	2,104	—	126	-133
National Fuel Gas Distribution Corp.	641	335	—	976	—	2	2	135,126	22,860	705,280	53,106	687,980	21,408
National Fuel Gas Supply Corp. *	1,374	1,493	473	3,340	16	3	19	149,742	58,204	303,047	22,544	476,770	22,535
Natural Gas Pipeline of America *	10,724	1,753	294	12,771	56	21	77	393,822	1,042,406	2,447,468	52,916	1,603,450	-107,046
North Penn Gas Co.	573	259	—	832	—	—	—	6,762	1,830	47,167	4,250	36,788	4,026
Northern Border Pipeline Co. *	824	—	—	824	2	—	2	—	367,874	1,295,269	563	235,948	57,499
Northern Natural, Div. of Enron *	16,318	7,398	208	23,924	123	5	128	387,434	1,208,742	2,179,139	30,924	1,447,272	108,969
Northwest Alaskan Pipeline Co.*	—	—	—	—	—	—	—	211,374	—	—	—	430,229	-389
Northwest Pipeline Corp. *	3,543	3,476	7	7,026	29	26	55	100,140	450,495	1,351,983	15,980	563,066	5,964
Ohio River Pipeline Corp.	24	—	—	24	—	—	—	7,573	—	3,684	15	19,124	161
Orange & Rockand Utilities Inc.	—	—	—	—	—	—	—	21,996	—	131,550	7,937	443,409	44,238
Overthrust Pipeline Co.*	89	—	—	89	—	—	—	—	63,460	63,041	—	9,978	2,244
Ozark Gas Transmission System	—	—	—	—	—	—	—	—	37,470	146,300	418	25,255	2,787
Pacific Gas Transmission Co. *	799	42	—	841	12	1	13	371,350	120,037	415,515	8,114	793,401	9,518
Pacific Interstate Offshore Co.	—	—	—	—	—	—	—	16,476	—	12,014	—	42,358	552
Pacific Interstate Transmission Co.	351	—	—	351	2	—	2	93,733	—	63,513	313	305,762	1,528
Pacific Offshore Pipeline Co.	—	—	—	—	—	—	—	9,701	—	148,804	3,812	72,922	6,023
Paiute Pipeline Co.	768	—	—	768	4	—	4	9,377	41	55,682	4,762	28,923	982
Panhandle Eastern Pipe Line Co. *	6,663	5,870	127	12,660	68	67	135	54,106	536,066	1,583,659	65,059	597,144	-179,260
Pelican Interstate Gas System	85	—	—	85	—	—	—	—	13,378	11,081	—	1,806	-27
Penn-Jersey Pipe Line	4	—	—	4	—	—	—	—	755	234	—	62	-1
Penn-York Energy Corp.	—	—	39	39	—	2	2	—	—	59,771	-433	25,788	6,325
Pennsylvania & Southern Gas Co.	—	—	—	—	—	—	—	4,691	1,347	19,033	1,343	23,263	1,306

GAS PIPELINES (continued)

Company	Miles of pipeline Transmission	Field	Storage	Total	Total compressor stations Transmission	Other	Total	Volumes, MMcf Sold	Trans. for others	Fiscal data, $1,000 Gas plant	Additions	Operating revenues	Net income
Phillips Gas Pipeline Co.	153	—	—	153	—	—	—	619	42,362	48,603	494	3,630	-3,170
Point Arguello Natural Gas Line (new)	—	—	—	—	—	—	—	—	—	—	—	—	—
Questar Pipeline Co. *	1,558	745	50	2,353	13	30	43	54,752	103,828	369,432	11,464	216,529	19,460
Raton Gas Transmission Co. Inc.	21	—	—	21	—	—	—	1,158	—	534	1	3,997	60
Ringwood Gathering Co.	43	273	—	316	—	2	2	1,835	6,357	10,543	236	5,986	138
Sabine Pipe Line Co.	193	—	—	193	—	—	—	—	51,674	39,033	1,671	3,360	-748
Sea Robin Pipeline Co. *	4[illegible]	—	—	420	2	1	3	3,244	184,256	252,176	1,696	51,908	5,693
Seagull Interstate Corp.	7	5	—	12	—	—	—	—	10,815	6,234	—	673	-66
Shenandoah Gas Co.	82	—	—	82	—	—	—	4,257	—	17,695	2,080	16,495	454
South County Gas Co.	—	—	—	—	—	—	—	418	147	3,391	183	3,046	200
South Georgia Natural Gas Co.	767	—	—	767	2	—	2	6,297	16,460	23,455	311	35,102	515
South Penn Gas Co.	17	—	—	17	—	—	—	267	—	679	10	1,200	42
Southeastern Natural Gas Co. of Ohio	—	—	—	—	—	—	—	8	—	5	—	753	-108
Southern Energy Co (LNG)	—	—	—	—	—	—	—	—	—	155,228	51	11,092	467
Southern Natural Co. *	7,656	108	48	7,812	48	13	61	153,048	52,052	1,313,248	52,603	781,757	79,379
Southwest Gas Storage Co.	—	—	31	31	—	1	1	—	—	68,967	1	20,924	6,253
Southwest Gas Transmission Co.	—	8	—	8	—	—	—	—	17,098	1,539	—	355	58
Stingray Pipeline Co. *	354	—	—	354	2	—	2	—	240,169	247,798	522	32,156	5,849
Superior Offshore Pipeline Co.	112	—	—	112	—	—	—	—	50,360	12,894	13	652	90
Tarpon Transmission Co.	40	—	—	40	—	—	—	—	24,225	21,088	—	1,456	192
T C P Gathering Co.	—	20	—	20	—	—	—	—	1,596	1,163	21	178	63
Tennessee Gas Pipeline Co.*	14,138	31	2	14,171	68	1	69	380,964	1,103,741	3,669,048	66,672	1,593,414	854,388
Texas Eastern Transmission Corp.*	9,859	48	196	10,103	77	8	85	679,106	302,781	3,096,396	197,129	2,054,952	61,947
Texas Gas Pipe Line Corp.	6	—	—	6	—	—	—	1,995	261	433	108	3,860	87
Texas Gas Transmission Corp. *	5,745	45	219	6,009	27	9	36	210,931	634,590	950,659	28,762	816,137	31,356
Texas Sea Rim Pipeline Inc.													
Trailblazer Pipeline Co. *	436	—	—	436	—	—	—	—	58,036	269,206	-11	30,537	-3723
Transco Gas Supply Co. *	—	—	—	—	—	—	—	29,483	—	10	—	83,144	2,035
Transcontinental Gas Pipe Line Corp.*	10,458	149	121	10,728	40	33	73	234,017	1,524,175	3,351,127	178,352	1,225,574	-3,192
Transwestern Pipeline Co. *	4457	—	—	4,457	22	97	119	90,472	261,206	696,462	9,421	391,473	22,973
Trunkline Gas Co. *	4,044	498	27	4,569	21	14	35	156,674	341,001	1,008,259	27,101	628,491	-93,728
Trunkline LNG Co.	—	—	—	—	—	—	—	—	—	579,036	68	9,348	-48,920
U-T Offshore System *	30	—	—	30	—	—	—	—	304,516	63,055	31	6,214	1,076
Union Light, Heat & Power Co., The	—	—	—	—	—	—	—	11,328	7,839	79,964	7,472	185,789	6,199
United Cities Gas Co.	—	—	—	—	—	—	—	35,780	241	186,646	22,129	168,723	5,701
United Gas Pipe Line Co. *	7362	,2383	28	9,773	29	13	42	76,139	729,852	1,142,703	21,097	713,816	45,498
Valero Interstate Transmission Co.	—	—	—	—	—	—	—	213	51,085	13,942	488	5,783	179
Valley Gas Transmission Inc.	—	200	—	200	—	—	—	2,943	2,664	2,980	8	6,378	1,111
Washington Gas Light Co.	379	—	—	379	—	—	—	117,517	2	926,255	90,318	668,301	45,069
West Texas Gas Inc.	—	—	—	—	—	—	—	707	—	19,287	235	24,341	6,025
West Texas Gathering Co.	—	—	—	—	—	—	—	4,006	3,304	4,368	22	8,869	-1,005
Western Gas Interstate Co.	191	50	—	241	9	—	9	3,395	—	8,197	87	7,476	339
Western Transmission Corp.	—	61	—	61	—	—	—	—	5,221	600	20	528	276
Wheeler Gas, Inc. (Final)	—	—	—	—	—	—	—	21	—	—	-424	72	349
Williams Natural Gas Co. *	5,857	3,770	175	9,802	40	55	95	151,665	154,715	669,601	36,234	502,912	32,680
Williston Basin Interstate Pipeline Co. *	3,071	847	148	4,066	23	7	30	31,508	38,430	205,592	2,994	119,776	3,937
Wyoming Interstate Co. Ltd. *	269	—	—	269	1	—	1	—	70,988	176,570	-198	23,196	1,668
Zenith Natural Gas Co.	27	32	—	59	—	2	2	1,127	38	784	157	2,743	67
1988 Totals-majors (43)	**186,723**	**62,800**	**4,542**	**254,065**	**1,232**	**884**	**2,116**	**6,383,690**	**15,665,971**	**44,018,804**	**2,140,075**	**26,740,552**	**1,415,225**
1987 Totals-majors (44)	180,737	63,356	8,354	252,447	1,205	827	2,032	6,266,593	12,880,681	†42,040,766	1,208,123	26,358,565	1,117,717
1988 Totals-all	**204,192**	**72,393**	**4,796**	**281,381**	**1,336**	**938**	**2,274**	**7,523,542**	**16,542,847**	**50,910,100**	**2,250,038**	**32,736,380**	**1,572,609**
1987 Totals-all	198,578	72,981	8,526	280,085	1,331	897	2,228	7,301,292	13,505,501	†49,969,424	1,596,481	†31,596,171	†1,438,203

Source: FERC Forms 2's and 2-A's for major and nonmajor natural-gas pipeline companies. Under critera established for the 1984 reporting year (OGJ, Nov. 25, 1985, p. 80).

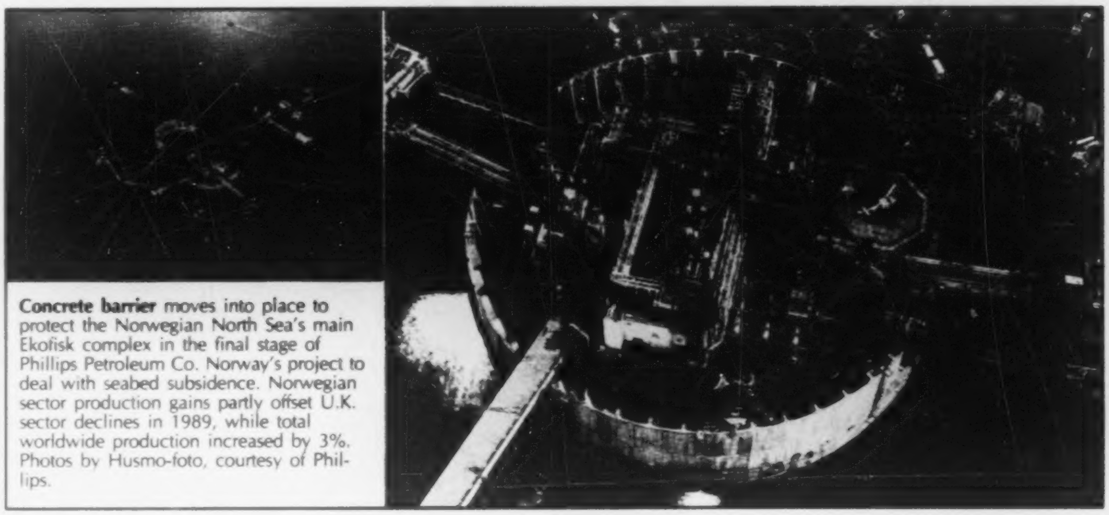
Major pipeline companies are those whose combined gas sold for resale and gas transported for a fee exceeded 50 bcf at 14.73 psi (60°F.) in each of the 3 previous calendar years.

Nonmajors are natural-gas pipeline companies not classified as majors and having had total gas sales of volume transactions exceeding 200 MMcf at 14.73 psi (60°F.) in each of the 3 previous calendar years.

* Major natural-gas pipeline companies under FERC Accounting and Reporting Requirements for Natural Gas Companies, para. 20-011, effective Feb. 2, 1985, beginning with 1984 reporting year.

†Revised from initial publication.

OGJ SPECIAL


Concrete barrier moves into place to protect the Norwegian North Sea's main Ekofisk complex in the final stage of Phillips Petroleum Co. Norway's project to deal with seabed subsidence. Norwegian sector production gains partly offset U.K. sector declines in 1989, while total worldwide production increased by 3%. Photos by Husmo-foto, courtesy of Phillips.

OPEC's reserves share up in turbulent '80s

The turbulent 1980s end with the Organization of Petroleum Exporting Countries in firmer control of future crude oil supply than it was when the decade began. Whether that control extends to price will depend on demand, group discipline, and production elsewhere.

OPEC now accounts for 77% of worldwide crude oil and lease condensate reserves, according to Oil & Gas Journal estimates in its annual Worldwide Report. That compares with a 68% reserves share at the end of the 1970s. And it's an enlarged share of a reserves total that grew by 56% during the decade.

OGJ estimates total world oil reserves at slightly more than 1 trillion bbl as of Jan. 1, 1990, with OPEC's 13 member countries accounting for 767 billion bbl.

On Jan. 1, 1980, OGJ estimated OPEC's reserves at 435.6 billion bbl and the worldwide total at 641.6 billion bbl (OGJ, Dec. 31, 1979, p. 67).

While OPEC enhanced its dominance of oil reserves, the world's two largest single country producers lost ground.

Total reserves in the U.S.S.R. and U.S. slipped 10% in the decade to 84.26 billion bbl. Soviet reserves dropped to an estimated 58.4 billion bbl from 67 billion bbl in 1980. U.S. reserves fell to 25.9 billion bbl from 26.5 billion bbl.

Reserves in non-OPEC countries outside the U.S. and U.S.S.R. jumped by 33% during the decade to 150.2 billion bbl.

Despite falling reserves, the U.S.S.R. and U.S. maintained their combined share of total worldwide oil production, largely on the strength of Soviet gains offsetting—at least for a time—late-decade U.S. declines.

Thus, the two countries accounting for one third of the world's production in 1979 and 1989 saw their combined share of total reserves slip to 8% from 15% in the same period.

WORLDWIDE
REPORT

The Soviet-U.S. production share ultimately must follow the reserves share trend.

U.S. oil production—down 6% to 7.68 million b/d this year—hasn't tallied an annual increase since 1985 and probably won't anytime soon. Exploration of major frontier prospects is mostly foreclosed by environmental politics, and oil drilling in general is moribund.

Soviet production, although up for the decade, is wavering, falling below 12 million b/d at times this year to average 12.15 million b/d, down 2.4% from 1988. Technical, bureaucratic, and financial problems hamper exploration and development. Although the Soviet resource base is larger, reversal of the reserves decline remains unlikely until the state run industry resolves its operating and budgetary woes and secures foreign technical and financial help.

In the 1990s, therefore, the Organization of Petroleum Exporting Countries will remain in charge of supply—only more so than in the 1980s. Output from the U.S.S.R. and U.S. will fade. And non-OPEC producers outside the U.S. and U.S.S.R. will compete with OPEC members to take up the production slack.

Here are other highlights of this year's OGJ Worldwide Report, based on extensive production, reserves, and refining capacity surveys:

- The oil reserves total is up 10% from last year.
- Natural gas reserves total 3.989 quadrillion cu ft, up fractionally.
- Worldwide oil production averaged an estimated 59.4 million b/d this year, up 1.7 million b/d from the previous year.
- OPEC's average oil production climbed 2 million b/d from the previous year to 21.7 million b/d—37% of the worldwide total.
- Refinery crude capacity totals 74.05 million b/d, up 1%.

OPEC's dominance. Just as OPEC increasingly dominates worldwide oil reserves, Persian Gulf members and Venezuela increasingly dominate the OPEC total.

Nearly all the decade's 76% jump in group reserves came in those two areas, most within the past 3 years. Iran, Iraq, the United Arab Emirates, and Venezuela disclosed sharp increases in 1987, a year of slack drilling when a 165 billion bbl OPEC gain, based largely on reappraisals, paced a 27% increase worldwide.

Earlier this year Saudi Arabia raised its reserves estimate by 85 million bbl—the equivalent of U.S. and Venezuelan reserves combined—to 254.96 billion bbl. That's more than one fourth of the world's total.

Other OPEC members' gains from last year weren't nearly as large, and some members' reserves dropped. Among declines were Indonesia's 50 million bbl and Neutral Zone's 10 million bbl.

More telling is the list of OPEC members whose reserves this year are sharply higher than their levels at the end of the 1970s: Iran up 60%, Iraq 223%, Kuwait 45%, Saudi Arabia 56%, United Arab Emirates 234%, and Venezuela 227%. Those are OPEC's powerhouses of the 1990s.

By contrast, some other members at times may not produce enough crude to export. A change in OPEC membership is possible.

The powerhouses, meanwhile, have returned to the business of exploring and adding production capacity.

Saudi Aramco, responsible for this year's huge reserves gain in Saudi Arabia, is exploring outside its traditional license area in the Eastern Province.

Iran and Iraq, recovering from war that ravaged their industries most of the decade, lead the exploration push in the Persian Gulf. And Venezuela is exploring for light and medium crudes and expects another major reserves increase.

Having reasserted their dominance in reserves, OPEC's leaders this year began to focus on production capacity. With expansions under way in Iran and Iraq, Saudi Arabia discussed lifting its capacity to 10 million b/d from 7 million b/d, Kuwait considered a 1.3 million b/d boost to about 3 million b/d, and Abu Dhabi planned to increase exploration-production investments. Venezuela raised its capacity target to 3.2 million b/d.

OPEC production. Production capacity replaced reserves at the center of debate when OPEC ministers met to adjust quotas in November.

The group began 1989 with an 18.5 million b/d ceiling for the first half and raised it to 19.5 million b/d for the second half, and to 20.5 million b/d for the fourth quarter.

Overproduction by several members made the quota discussions academic. Production averaged 19.9 million b/d in the first quarter and 21.1 million b/d in the second and third. In the weeks before the Vienna quota-fixing meeting, OPEC flow at times exceeded 23 million b/d.

The United Arab Emirates and Kuwait were the biggest overproducers throughout the year. Kuwait publicly said it would not accept its quota, while the U.A.E. initialed the OPEC agreements but ignored them.

In the fourth quarter, Saudi Arabia, Iran, Iraq, Nigeria, and Venezuela produced well in excess of their quotas.

Strong demand averted a price collapse but kept the $18/bbl target out of OPEC's reach through most of the year.

OPEC members apparently are looking to the mid-1990s for what Kuwaiti Oil Minister Ali Khalifa al Sabah calls a comfort zone.

In addition to the production capacity pushes in the Middle East and Venezuela, Nigeria is preparing for the 1990s with plans to beef up exploration and production. It's selling part of the state's prime acreage holdings to foreign companies.

North Sea cuts. Production cuts in Northwest Europe combined with surprising demand strength to mute effects of OPEC's 1989 production spree.

Output from the U.K. North Sea was hurt by 1988's Piper Alpha disaster and a series of accidents this year.

Those cuts were partly offset by brisk increases from the Norwegian sector. Without the slump in U.K. oil deliveries, North Sea output would have steamed ahead while OPEC members were boosting exports.

U.K. production had been averaging just over 2.5 million b/d before the Piper Alpha explosion reduced output to about 2.1 million b/d. This year started with shutdown of Fulmar field when the floating storage unit broke loose in a storm.

Then the Brent pipeline system had to be shut down because of a gas explosion on the Cormorant A platform. Output slumped to a low of 1.35 million b/d in June, recovering to 2 million b/d later in the year.

The Norwegian gains occurred despite the government's 7.5% production restraint. Output jumped from 1.2 million b/d in summer 1988 to 1.59 million b/d at the beginning of 1989 and was on its way to 1.8 million b/d by the end of the year. Norwegian flow averaged 1.47 million b/d for the entire year, up 34% from 1988.

Among the smaller North Sea producers, Denmark gained 16% to 110,000 b/d, Netherlands 15% to 87,000 b/d.

U.K. North Sea flow will rebound by about 300,000 b/d in 1990, filling part of the 900,000-1 million b/d of oil consumption growth the International Energy Agency expects outside the centrally planned economies in the first 3 quarters.

That consumption growth follows a 1 million b/d increase this year to 51.9 million b/d. OPEC will fill most of the demand increment not satisfied by the North Sea recovery.

After 1990, opportunities for OPEC

and—increasingly—non-OPEC producers in the developing world will be a function of further demand growth and declines in traditional producing areas.

Other producers. Aggressive exploration is paying off in developing nations and nontraditional producers, many of which have offered large blocks of acreage under favorable terms to international companies.

Production in North Yemen, which started significant output only 2 years ago, gained 11% this year 177,000 b/d in a trend that will continue for several years. Syrian production this year jumped by 17% to 300,000 b/d.

A less prolific example is Turkey, where production and reserves remain low but where international attention is growing rapidly.

The country hiked its oil reserves estimate to 521 million bbl this year from 381 million bbl a year ago, citing discovery of Karakus field by state owned Turkiye Petrolleri Anonim Ortakligi.

Some industry sources think an ambitious licensing and exploration program now under way might lead to discovery of 2 billion bbl or more of reserves. Production remains low—just 55,000 b/d in 1989, up 5% for the year.

Several non-OPEC African nations added significantly to reserves this year, among them Congo, 120 million bbl, and Egypt, 200 million bbl. Ivory Coast's reserves fell by 20 million bbl to 100 million bbl. Congo's production gained 11.4% to 150,000 b/d.

In the Asia-Pacific region, Australia's production dropped 6% to 488,800 b/d, largely due to economically motivated shut-ins in the key Bass Strait producing area. But the country, with reserves up about 3 million bbl to 1.68 billion bbl, has one of the world's exploratory hot spots in the Timor Sea off Western Australia.

India, one of the most active countries for drilling, added nearly 1.2 billion bbl to its reserves estimates last year, bringing the total to 7.5 billion bbl, and increased production by 6% to 673,000 b/d.

Malaysia, another country recently licensing acreage, boosted production by 3% to 557,300 b/d and reserves by 28 million bbl to 2.95 billion bbl.

Thailand nearly tripled its reserves estimate to 230.7 million bbl on the strength of a revision for the Sirikit complex, its only producing field, and condensate from new gas fields to be developed in the Gulf of Thailand.

Western Hemisphere trends. Canada, like its southern neighbor, reduced its oil reserves estimate this year—to 6.13 billion bbl from 6.79 billion bbl a year earlier. Oil production dropped marginally to 1.58 million b/d.

Two key Latin American producers raised reserves estimates but face major problems financing development. Mexico, despite a drilling slump, added more than 2 billion bbl to oil reserves, pushing the total to 56.37 billion bbl. It held production at about 2.6 million b/d.

Brazil hiked reserves to 2.8 billion bbl from 2.55 billion bbl and boosted production by 9% to 597,000 b/d. But financial problems plague state owned Petroleos Brasileiro SA, and recent constitutional changes prevent upstream participation by foreign firms.

Several Latin American countries pushed exploration by foreigners in 1989. Argentina, with production of 459,000 b/d and reserves of 2.28 billion bbl, negotiated more than 20 exploration and development service contracts during the year and is relaxing government control of its oil industry.

Also actively seeking international capital for exploration are Ecuador, an OPEC member straining to maintain exports, and Peru, where reserves dropped by 45 million bbl and a financial crisis stalled activity not only by the state oil company but also by contract producers not paid for their work.

Refineries gain. OGJ's refining survey indicates continued stabilization of the trend of plant closures that characterized the 1980s.

The survey identified 734 operating refineries, up from 707 last year and the highest total since the 731 of 1984. That also was the most recent year in which worldwide capacity exceeded 74 million b/d.

Biggest gain in number of refineries came in the Western Hemisphere, where the plant total increased to 295 from 286 a year earlier. The U.S. total increased 6 to 188.

The only other region with a gain in number of refineries is Western Europe, up 3 plants.

In the 1990s, key challenges facing refiners in the U.S. and Europe will be tighter product specifications resulting from environmental concerns.

Major distillation capacity gains likely will come in developing countries with rapid demand growth, especially in Asia-Pacific.

Countries in the region planning major new refineries include India, Indonesia, Malaysia, and Thailand.

Biggest project planned for start-up soon, meanwhile, is Saudi Arabia's long delayed 325,000 b/d refinery at Rabigh. The plant is to begin operations in January. ▪

OIL Charger, one of the largest aluminum crew and utility boats in West Africa, passes BG Gabon Inc.'s Obando Marine central process platform off Gabon. Boat operator OIL Ltd. provides offshore support for the field.

Worldwide oil and gas at a glance

COUNTRY	ESTIMATED PROVED RESERVES 1-1-90 Oil (1,000 bbl)	Gas (bcf)	OIL PRODUCTION Producing wells* 12-31-88	Estimated 1989 (1,000 b/d)	% change from 1988	REFINING Capacity on 1-1-90 No. of ref.	Crude (b/cd)	Thermal operations (b/cd)	Catalytic cracking (b/cd)	Catalytic reforming (b/cd)
ASIA-PACIFIC										
Australia	1,676,500	16,467	951	488.8	−5.6	10	675,000	...	194,700	164,000
Bangladesh	500	12,360	10	0.9	...	1	31,200	...	...	1,650
Brunei	1,375,000	11,370	583	143.3	+3.8	1	10,000	...	...	...
Burma	51,300	9,430	450	12.0	−20.0	2	32,000	5,200	...	...
China, Taiwan	4,600	840	83	2.6	+4.0	2	570,000	13,500	22,500	56,250
India	7,516,400	22,973	1,866	673.3	+6.0	12	1,079,842	110,670	136,370	26,230
Indonesia	8,200,000	87,015	6,470	1,208.6	+6.2	6	714,200	81,700	12,600	61,500
Japan	60,818	1,116	387	11.3	−8.1	41	4,198,450	85,800	617,225	531,800
Korea, South	...	...	...	...	...	6	867,000	48,700	...	62,450
Malaysia	2,950,000	51,900	467	557.3	+3.2	4	209,300	...	...	24,600
New Zealand	146,000	5,120	49	28.0	−0.4	1	95,100	...	...	26,600
Pakistan	118,563	18,000	80	45.0	−0.9	3	120,925	...	...	5,100
Papua New Guinea	200,000	4,520	...	...	...	...	...	...	...	...
Philippines	15,000	10	13	4.0	−33.3	4	283,800	...	23,100	39,900
Singapore	...	...	...	...	...	5	830,000	170,500	...	61,300
Sri Lanka	...	...	...	...	...	1	50,000	12,500	...	3,750
Thailand	230,670	6,910	245	39.0	+5.4	3	214,850	17,600	15,700	20,750
Total Asia-Pacific	**22,545,351**	**248,031**	**11,654**	**3,214.1**	**+3.1**	**102**	**9,981,667**	**546,170**	**1,022,195**	**1,085,880**
WESTERN EUROPE										
Austria	65,997	400	987	23.3	+4.0	1	204,000	23,426	24,000	32,000
Belgium	...	...	...	...	...	4	613,500	62,800	104,700	81,400
Cyprus	...	...	...	...	...	1	18,000	...	...	4,300
Denmark	849,124	4,450	65	111.0	+15.9	3	186,500	73,670	...	31,100
Finland	...	...	...	...	...	2	241,000	46,300	41,800	42,900
France	189,899	1,180	608	65.3	−3.4	14	1,819,900	152,850	352,500	247,400
Germany, West	400,000	6,640	2,917	74.7	−4.0	16	1,507,200	283,262	182,700	283,300
Greece	72,500	210	11	17.0	−24.4	4	384,500	41,120	50,500	46,100
Ireland	...	...	...	...	...	1	56,000	...	...	11,000
Italy-Sicily	727,103	11,693	193	94.7	+4.2	21	2,803,600	412,900	305,700	334,850
Netherlands	169,800	61,100	289	87.0	+14.5	7	1,380,700	155,600	125,500	178,600
Norway	11,546,204	82,160	223	1,469.8	+33.7	3	295,000	76,000	41,000	46,000
Portugal	...	...	...	...	...	3	313,300	...	10,100	52,200
Spain	25,000	810	44	18.0	−37.9	10	1,293,000	174,000	173,300	172,000
Sweden	...	...	...	...	...	5	427,500	65,000	25,000	72,000
Switzerland	...	...	...	...	...	2	132,000	20,000	...	26,000
Turkey	520,850	705	625	55.5	+4.9	5	724,654	4,500	34,128	63,127
United Kingdom	4,255,620	20,836	755	1,743.0	−23.1	15	1,831,100	157,000	459,000	312,200
Total Western Europe	**18,822,097**	**191,914**	**6,717**	**3,759.3**	**−3.7**	**117**	**14,231,454**	**1,748,428**	**1,929,928**	**2,036,477**
MIDDLE EAST										
Abu Dhabi	92,205,000	182,900	1,001	1,359.0	+18.6	2	180,000	...	...	30,100
Bahrain	111,708	6,476	267	42.2	+6.6	1	243,000	20,000	39,000	18,000
Dubai	4,000,000	4,900	150	410.6	+15.6	...	...	...	...	...
Iran	92,860,000	500,000	361	2,934.3	+30.6	4	530,000	80,800	...	63,845
Iraq	100,000,000	95,000	820	2,830.0	+5.3	8	318,500	...	...	43,500
Israel	1,483	9	12	0.3	−25.0	2	180,000	67,000	24,000	26,000
Jordan	5,000	58	3	0.3	...	1	100,000	...	4,410	8,640
Kuwait	94,525,000	48,600	363	1,542.6	+15.6	4	819,000	54,000	42,000	33,000
Lebanon	...	...	...	...	...	2	37,000	...	7,250	7,492
Neutral Zone	5,200,000	12,000	501	396.6	+26.7	...	...	...	...	...
Oman	4,250,000	9,260	1,093	622.7	+1.2	1	76,932	...	...	15,386
Qatar	4,500,000	163,100	174	394.6	+14.1	1	62,000	...	...	12,030
Ras al Khaimah	400,000	2,000	6	10.0	...	...	...	...	...	...
Saudi Arabia	254,959,000	181,347	588	4,935.6	−0.2	7	1,007,000	34,000	82,400	167,600
Sharjah	1,500,000	11,000	20	65.0	...	...	...	...	...	...
Syria	1,730,000	4,000	963	300.6	+17.4	2	243,744	36,384	...	28,080
Yemen, North	1,000,000	5,500	60	176.6	+11.1	1	10,000	...	...	2,500
Yemen, South	3,000,000	...	...	10.0	...	1	161,500	...	...	10,800
Total Middle East	**660,247,191**	**1,226,150**	**6,382**	**16,031.0**	**+10.3**	**37**	**3,968,676**	**292,184**	**199,060**	**466,973**

EDITOR'S NOTE: All reserves figures except those for the U.S.S.R. (and gas for Canada) are reported as proved reserves recoverable with present technology and prices. U.S.S.R. figures are "explored reserves" which include proved, probable, and some possible. Canadian gas figure, under criteria adopted by Canadian Petroleum Association in 1980, includes proved and some probable. *Does not include shut in, injection, or service wells. †Estimates based on capacity as of Jan. 1, 1989, plus known 1989 closures and expansions. §Includes Albania, Bulgaria, Cuba, Czechoslovakia, East Germany, Hungary, Mongolia, North Korea, Poland, Romania, Viet Nam, and Yugoslavia.

COUNTRY	ESTIMATED PROVED RESERVES 1-1-90		OIL PRODUCTION			REFINING Capacity on 1-1-90				
	Oil (1,000 bbl)	Gas (bcf)	Producing wells* 12-31-88	Estimated 1989 (1,000 b/d)	% change from 1988	No. of ref.	Crude (b/cd)	Thermal operations (b/cd)	Catalytic cracking (b/cd)	Catalytic reforming (b/cd)
AFRICA										
Algeria	9,200,000	114,000	840	698.0	+ 8.9	4	464,700	...	...	55,600
Angola-Cabinda	2,024,000	2,100	422	454.7	+ 0.8	1	32,100	...	...	1,900
Benin	100,000	...	6	4.5	...	...	...	...	...	...
Cameroon	400,000	3,880	175	172.7	+ 0.4	1	43,020	...	...	6,920
Congo	830,000	2,580	310	150.0	+ 11.4	1	21,000	...	...	2,000
Egypt	4,500,000	11,720	874	854.3	+ 0.7	8	489,203	16,470	...	30,940
Ethiopia	...	800	...	...	...	1	18,000	...	...	2,270
Gabon	733,000	560	312	197.3	+ 12.7	1	24,000	7,200	...	1,400
Ghana	1,000	...	...	...	...	1	26,600	...	...	5,850
Ivory Coast	100,000	3,530	17	2.0	− 81.8	2	69,000	...	...	13,600
Kenya	...	...	...	...	...	1	95,000	...	...	9,000
Liberia	...	...	...	...	...	1	15,000	...	...	2,000
Libya	22,800,000	25,500	678	1,100.6	+ 7.4	3	329,400	...	...	14,182
Madagascar	...	70	...	...	...	1	16,350	7,000	...	2,600
Morocco	2,500	100	5	0.3	− 25.0	2	154,600	...	5,600	26,800
Mozambique	...	2,290	...	...	...	...	...	...	...	...
Nigeria	16,000,000	87,400	1,513	1,605.3	+ 15.6	4	433,250	...	82,700	70,070
Senegal	...	...	...	...	...	1	24,000	...	...	2,600
Sierra Leone	...	...	...	...	...	1	10,000	...	...	...
Somalia	...	210	...	...	...	1	10,000	...	...	...
South Africa	...	1,760	...	...	...	4	433,500	63,500	84,400	62,800
Sudan	300,000	3,000	...	...	...	1	25,000	...	...	2,100
Tanzania	...	4,100	...	...	...	1	13,500	...	...	3,000
Tunisia	1,750,000	3,100	152	102.0	− 0.8	1	34,000	...	...	3,300
Zaire	96,120	30	107	27.5	− 5.8	1	17,000	...	...	3,500
Zambia	...	...	...	...	...	1	24,500	...	...	5,600
Total Africa	**58,836,620**	**266,730**	**5,411**	**5,369.2**	**+ 7.7**	**44**	**2,822,723**	**94,170**	**172,700**	**328,032**
WESTERN HEMISPHERE										
Argentina	2,279,900	27,299	9,061	459.0	+ 2.0	11	688,700	125,100	124,800	40,800
Barbados	3,190	7	85	1.2	...	1	3,000	...	...	...
Bolivia	182,000	5,475	301	20.3	+ 5.7	3	57,500	...	...	14,900
Brazil	2,816,000	3,849	6,166	597.1	+ 9.1	13	1,397,100	38,300	331,100	21,000
Canada	6,133,495	94,300	38,557	1,588.0	− 0.6	28	1,851,800	88,250	387,470	372,450
Chile	300,000	4,200	370	23.7	− 2.9	3	146,800	20,000	38,870	10,000
Colombia	2,060,000	4,020	2,785	405.0	+ 6.6	4	227,400	60,000	91,000	6,000
Costa Rica	...	...	...	...	...	1	16,200	6,500	...	1,200
Dominican Republic	...	...	...	...	...	2	48,500	...	...	9,000
Ecuador	1,514,000	3,990	952	286.6	− 7.3	5	145,000	21,126	16,000	2,800
El Salvador	...	...	...	...	...	1	17,000	...	...	3,200
Guatemala	41,600	10	14	3.7	...	1	16,000	...	...	3,000
Honduras	...	...	...	...	...	1	14,000	...	...	1,800
Jamaica	...	...	...	...	...	1	34,200	...	...	3,240
Martinique	...	...	...	...	...	1	12,000	...	...	3,000
Mexico	56,365,000	73,380	3,768	2,618.0	+ 0.5	9	1,514,000	82,000	267,000	157,800
Netherlands Antilles	...	...	...	...	...	1	320,000	67,000	42,000	15,000
Nicaragua	...	...	...	...	...	1	14,500	...	...	2,800
Panama	...	...	...	...	...	1	100,000	...	...	7,500
Paraguay	...	...	...	...	...	1	7,500	...	...	...
Peru	411,979	650	3,478	129.0	− 9.9	6	172,438	...	22,540	1,680
Puerto Rico	...	...	...	...	...	2	123,000	....	13,500	26,500
Suriname	28,200	...	99	3.7	+ 8.8	...	...	...	...	...
Trinidad & Tobago	521,000	9,968	3,255	153.7	+ 1.9	2	300,000	18,000	28,000	31,000
Uruguay	...	...	...	...	...	1	33,000	....	4,100	2,500
Venezuela	58,504,000	100,846	12,857	1,731.6	+ 5.0	6	1,201,100	138,000	193,100	6,000
Virgin Islands	...	...	...	...	...	1	545,000	80,000	...	125,000
United States	25,860,000	165,000	612,448	7,675.6	− 5.7	188	†16,243,841	†1,914,090	†5,252,900	†3,901,920
Total Western Hemisphere	**157,020,364**	**492,994**	**694,196**	**15,696.2**	**− 2.0**	**296**	**25,240,579**	**2,658,366**	**6,812,380**	**4,770,090**
Total non-Communist	**917,471,823**	**2,425,818**	**724,300**	**44,069.8**	**+ 3.6**	**595**	**56,254,099**	**5,339,316**	**10,136,263**	**8,687,452**
COMMUNIST AREAS										
China	24,000,000	35,300	43,700	2,770.0	+ 1.4	40	2,200,000	NA	NA	NA
U.S.S.R.	58,400,000	1,500,000	145,000	12,150.0	− 2.4	39	12,300,000	NA	NA	NA
Other§	1,700,000	28,000	NA	391.0	− 3.9	60	3,298,135	90,430	156,755	171,298
Total Communist	**84,100,000**	**1,563,300**	**188,700**	**15,311.0**	**− 1.8**	**139**	**17,798,135**	**90,430**	**156,755**	**171,298**
TOTAL WORLD	**1,001,571,823**	**3,989,118**	**913,000**	**59,380.8**	**+ 2.1**	**734**	**74,052,234**	**5,429,746**	**10,293,018**	**8,858,750**

Worldwide Production

• Offshore (e) Estimated (c) Condensate (NA) Not available

WORLDWIDE PRODUCTION

		Name of field, discovery date	Depth, ft	No. of wells Producing	No. of wells Total	Production 1988 average B/d	Production Cumulative to Dec. 31, 1988 Bbl	°API gravity
ABU DHABI(e)	ADCO, OTHERS	Asab, 1965	8,000- 8,700	106	248	1,145,800	8,878,262,800	40.8
		Bab, 1958	8,600- 9,300	100	232			40.6
		Bu Hasa, 1962	8,300- 9,200	201	371			39.0
		Sahil, 1967	9,500- 9,800	22	52			39.7
		• Umm Shaif, 1958	9,800-12,000	142	203			37.0
		• Zakum Lower, 1963	8,000-9,000	131	254			39.0
		• Zakum Upper, 1963	7,000-8,000	142	262			35.0
		• Umm Addalkh, 1969	7,700-8,500	32	54			32.5
		• Satah, 1975	8,550-9,500	10	21			39.8
		• Arzanah, 1973	11,000-11,300	14	34			44.6
		• Abu Al Bukhoosh, 1969	8,900-10,900	42	48			32.0
		• Mubarraz, 1969	8,300-10,000	28	28			37.0
		• Bunduq, 1964	9,400-10,900	23	40			40.0
		Total Abu Dhabi		**1,001**	**1,863**	**1,145,800**	**8,878,262,800**	
ALGERIA(e)	SONATRACH	Zarzaitine, 1957	4,700	840	840	641,000	7,772,386,000	42.2
		Edjeleh, 1956	1,500- 2,800					37.2
		Tiguentourine, 1966	2,160- 4,265					44.4
		El Adeb Lareche, 1958	4,100					43.3
		Assakaifaf N. & S., 1958	2,800					42.7
		Tan Emellel N. & S., 1960	2,800- 4,500					42.5
		Edeyen, 1964	5,580					41.5
		Hassi Mazoula S., 1963	4,430					40.2
		Hassi Mazoula B., 1965	4,920					42.0
		Acheb W. & Kreb, 1963 & 1960	7,360					45.6
		Tin Fouye N. + F6, 1962	4,265					39.6
		El Borma, 1967	8,200					42.9
		Keskassa, 1968	8,860					42.9
		Mereksen, 1974	9,420					45.8
		Gara, 1962	9,420					42.9
		Hassi Messaoud N., 1956	10,500					45.9
		Hassi Messaoud S., 1956	10,500					46.1
		Gassi-Touil & Gassi-Touil E., 1961	6,890					50.6-50.8
		Hassi Chergui	8,200					50.6
		Nezla N., 1965	8,530					51.5
		Rhourde El Baguel, 1962	9,850					40.2
		Mesdar E. & W., 1972	11,155					40.3
		El Gassi-El Agreb, 1959	10,170					47.9
		Rhourde Nouss & E., 1972	8,530					39.7
		Tin Foye Tabankort, 1966	4,600- 6,560					41.1-41.3
		Djoua W., 1967	5,580- 6,240					41.1
		Amassak, 1970	6,565					41.1
		Tamendjelt, 1970	5,585- 6,890					41.1
		Timedratine, 1964	8,155					42.7
		Ohanet N. & S., 1960	7,878					43.8
		Askarene, 1962	8,200					41.7
		Guelta, 1962	8,960					41.7
		Stah, 1971	9,515					45.8
		Ras Toumb, 1976	9,190					35.7
		Haoud Berkaoui-Ben Kahla, 1965	11,000					43.6
		Guellala-Guellala N.E., 1969	11,320					42.2-42.3
		N'Goussa, 1974	11,715					42.2
		Kef El Argoub, 1973	12,570					42.2
		Oued Noumer, 1969	8,860					48.3
		Djorf, 1974	9,025					48.3
		Djebel Onk, 1960	3,940					37.0
		Alrar FJT						
		Hassi R'Mel(c)						
		Gassi Touil(c)						
		Total Algeria		**840**	**840**	**641,000**	**7,772,386,000**	
ANGOLA	FINA ANGOLA	Benfica, 1955	8,300		14		2,266,000	30.0
		Bento, 1972	7,350	1	5	255	4,992,000	26.0
		C. Cobra, 1969	4,000	11	15	1,070	3,403,000	41.0
		Cacuaco, 1958	7,870	1	12	33	267,000	30.0
		Galinda, 1959	7,220		8		2,245,000	30.0
		Ganda, 1975	5,000	5	5	3,170	7,000,000	36.0
		Legua, 1972	6,300	1	3	78	697,000	31.0

		Name of field, discovery date	Depth, ft	No. of wells Producing	No. of wells Total	Production 1988 average B/d	Production Cumulative to Dec. 31, 1988 Bbl	°API gravity
		Luango, 1977	3,800	3	6	726	2,208,000	38.0
		Lumueno, 1977	4,600	11	23	2,956	4,755,000	37.0
		Mulenvos, 1966	5,900- 6,600	4	16	169	5,072,000	25.0
		N'Zombo, 1973	5,000- 6,300	24	37	11,160	91,606,000	33.0
		Pambo, 1982	4,600	4	4	971	2,034,000	39.0
		Pinda, 1966	6,709		4		3,000	26.0
		Quenguela, 1968	6,000	22	31	1,415	37,631,000	31.0
		Quinfuquena, 1975	6,800- 7,100	14	18	4,439	25,887,000	32.0
		Quinguila, 1972	3,400	20	58	8,054	36,053,000	36.0
		Sereia, 1974	6,200	3	4	1,005	1,441,000	27.0
		Tobias, 1961	1,970	1	12	52	28,830,000	31.0
	CHEVRON	• Kali, 1969	11,400-11,660	1	1	187	4,290,615	30.0
		• Kambala, 1971	10,500	5	5	6,147	19,796,132	32.8
		• Kungulo, 1975	4,000	16	17	9,598	46,602,964	32.2
		• Lifuma, 1984	7,800	1	1	34	196,758	31.4
		• Limba, 1969	2,660- 7,350	10	14	10,184	88,824,338	31.6
		• Livuite, 1979	8,000	3	7	260	2,571,343	31.7
		• Malongo North, 1966	1,170- 9,250	58	73	14,134	215,522,413	30.0
		• Malongo South, 1966	1,150- 1,440	29	33	8,374	75,456,179	25.0
		• Malongo West, 1969	1,680- 8,800	23	49	19,245	237,489,069	22.5
		• Numbi, 1980	3,446	21	21	47,163	19,535,314	34.0
		• Takula, 1971	3,070- 9,090	65	72	115,727	197,815,187	31.5
		• Vuko, 1983	3,700	6	6	8,664	10,002,147	35.0
		• Wamba, 1982	2,700	7	7	28,596	19,571,110	29.0
	TEXACO-SONANGOL-TOTAL-BRASPETRO	• Cuntala, 1978	7,200	...	1	224	2,264,669	31.0
		• Essungo, 1975	6,500	9	12	4,012	20,848,112	35.0
		• Lombo Este, 1983	7,800	9	10	15,432	5,922,941	41.0
		• Sulele Oeste, 1985	7,600	6	6	4,086	1,544,901	41.0
		• Tubarão, 1984	7,600	5	5	8,181	3,726,542	41.0
		• Suiele South 1, 1986	7,600	1	2	1,498	458,332	39.0
	ELF ANGOLA[e]	• Palanca, 1981	8,860	12	23	113,681	99,518,938	40.0
		• Pacassa, 1982	11,500	10	13			38.0
		Total Angola		**422**	**653**	**451,000**	**1,328,348,004**	
ARGENTINA	**YPF**	Chubut, 1907	1,908- 9,168	2,261	2,325	86,821	1,030,471,182	21.1-26.0
		Formosa, 1984	11,466-11,490	12	14	7,252	8,173,912	42.0-42.9
		Jujuy, 1969	2,461-16,732	9	9	925	61,270,462	46.5-47.0
		La Pampa, 1968	3,609- 4,921	198	209	10,410	78,879,745	31.0
		Mendoza, 1932	2,178-16,778	1,156	1,187	86,443	1,101,537,904	23.7-32.0
		Neuquen, 1918	1,312-12,498	1,160	1,205	77,166	512,722,915	24.0-41.0
		Rio Negro, 1960	2,953- 7,546	897	937	42,948	457,217,678	22.5-41.0
		Salta, 1928	6,551-15,092	33	43	9,731	123,185,970	29.0-59.0
		Santa Cruz, 1946	1,468-17,060	3,129	3,274	101,326	1,021,663,540	21.1-30.0
		Tierra del Fuego, 1959	5,249- 7,824	206	206	15,895	158,271,370	43.4-46.0
		Total Argentina		**9,061**	**9,409**	**438,917**	**4,553,394,678**	
AUSTRALIA	**BARRACK ENERGY**	Mount Horner, 1965	3,800- 5,800	6	10	275	120,650	38.0
	BHP PETROLEUM PTY. LTD	• Jabiru, 1983	4,786	4	4	40,800	27,300,000	42.3
	BOND CORP., PETROLEUM DIVISION	• Harriet, 1983	6,230	10	10	11,400	10,835,000	38.2
	AGL PETROLEUM	Alton, 1964	6,000	4	8	23	1,898,446	49.5
		Anabranch, 1965	4,188	...	...		13,718	44.0
		Bennett, 1965	5,960	1	1	4	117,265	45.0
		Cabawin, 1961	10,800	1	1	4	61,381	49.0
		Maffra, 1965	4,251	1	1	11	33,042	48.0
		Mereenie, 1964	4,000	21	36	2,096	3,974,118	48.9
		Moonie, 1961	5,800	19	36	599	21,898,878	44.5
		Richmond, 1963	3,643	...	...		16,345	43.0
		Snake Creek, 1964	4,990	1	1	1	13,158	67.0
		Sunny Bank, 1962	6,139					40.0
		Trinidad 1 & 3, 1965	4,599				63,560	46.0
	HARTOGEN ENERGY GROUP	Borah Creek, 1982	4,900	1	3	9	14,965	34.0
		Cranstoun, 1987	4,250	1	1	274	104,115	48.0
		Ipundu, 1986	2,700	1	1	64	67,403	43.0
		Kincora, 1980	4,700	1	11	12	300,702	34.0
		Monler, 1987	4,150	1	1	59	27,534	49.0
		Riverslea, 1981	4,950	2	2	102	332,989	37.0
		Sandy Creek, 1982	4,900	1	1	2	8,730	34.0
		Talgeberry, 1985	3,900	2	3	207	293,490	46.0
		Takyah, 1985	3,800	1	1	19	15,573	43.0
		Tarbat, 1988	2,700	1	1	30	10,920	43.0
		Tintaburra, 1984	3,500	5	6	327	544,424	43.0
		Toobunyah, 1985	3,500	4	5	320	315,386	43.0
		Waratah, 1982	5,350	4	5	61	283,970	34.0
		Washpool, 1985	5,250	1	1	1	1,231	35.0
	EROMANGA ENERGY	Blina, 1981	4,300	5	5	323	1,177,614	37.0
		Lloyd, 1987	4,806	1	1	186	82,282	37.0

	Name of field, discovery date	Depth, ft	No. of wells Producing	Total	Production 1988 average B/d	Cumulative to Dec. 31, 1988 Bbl	°API gravity
	Sundown, 1983	3,600	2	2	43	180,753	39.0
	West Terrace, 1985	3,800	2	2	46	122,738	33.0
LASMO	Black Stump, 1986	5,360	1	1	69	143,689	45.2
	Bodalla South, 1984	4,800- 5,230	6	6	1,772	3,407,102	47.2-48.7
	Glenvale, 1985	3,800	...	1	1	18,128	49.3
	Kenmore, 1985	4,600- 4,980	10	11	1,873	2,645,432	48.2-45.8
SANTOS LTD.	Alwyn, 1985	5,200	1	1	76	105,000	41.0
	Big Lake, 1984	6,600	2	3	247	370,000	45.0-48.0
	Bogala, 1984	6,900	2	2	165	304,000	40.0
	Bookabourdie, 1985	7,000	2	2	88	80,000	46.0
	Broiga, 1983	9,547	1	1	7	2,646	53.0
	Challum, 1983	...	...	1	21	21,000	...
	Chookoo, 1985	6,000	4	7	337	368,000	45.0
	Cook, 1985	...	...	1	15	29,000	...
	Cooroo/Cooroo North, 1986		4	5	1,058	860,000	...
	Dingera, 1987	...	1	1	2	1,000	...
	Dirkala, 1986	7,000	1	2	165	533,000	56.0
	Dullingari, 1979	5,200	16	30	3,091	7,175,000	54.0
	Fly Lake, 1971	9,300	1	2	55	20,006	53.0
	Gidgealpa, 1984	6,150	12	13	2,562	2,939,000	45.0-50.0
	Gunna, 1983	6,000	1	1	15	76,000	40.0
	Jackson, 1981	4,750	35	36	12,260	24,478,000	40.0-48.0
	Jackson South, 1982	4,800	5	8	650	2,121,000	40.8
	Jena, 1985	5,200	2	2	70	82,000	41.0
	Kercummura, 1985	...	...	1	...	1,000	50.8
	Kerinna, 1984	4,300	1	1	7	17,000	41.0
	Limestone Creek/Biala, 1984	5,100	10	11	986	1,352,000	41.0
	Mawson, 1987	...	1	1	94	85,000	...
	McKinlay, 1985	5,100	1	2	12	31,000	41.0
	Meranji, 1985	5,660	3	3	229	401,000	41.0
	Merrimelia, 1983	5,250- 7,070	10	11	2,333	3,359,000	35.5
	Mooliampah, 1985	6,000	2	2	35	77,000	40.0
	Moorari, 1971	7,705- 9,400	5	5	629	229,568	46.9
	Munro, 1988	...	2	2	110	40,000	...
	Muteroo, 1985	6,000	5	5	1,247	1,967,000	45.0
	Naccowlah East, 1988	...	...	1	...	...	...
	Naccowlah South, 1983	6,000	9	10	645	2,305,000	40.0-46.0
	Naccowlah West, 1983	5,700	7	8	1,514	2,099,000	40.0
	Natan	...	1	1	8	3,000	...
	Narcoonowie, 1983	6,000	2	2	98	154,000	52.0-53.0
	Nungaroo, 1985	4,150	1	1	30	50,000	40.0
	Pintari North, 1988	...	1	1	54	20,000	...
	Pitchery, 1988	...	1	1	132	48,000	...
	Sigma, 1983	5,700	2	2	116	113,000	40.0
	Spencer, 1986	6,500	5	5	1,678	1,081,000	47.0
	Strzelecki, 1978	5,800	16	17	3,721	12,663,000	43.0-49.0
	Sturt, 1988	...	4	4	80	29,000	...
	Sturt East	...	3	3	20	7,000	...
	Taloola, 1988	...	2	2	333	122,000	...
	Tantanna, 1988	...	4	4	861	314,000	...
	Tickalara, 1984	5,600	5	5	744	421,000	40.0
	Tinpilla, 1983	6,000	1	1	35	79,000	40.0
	Tirrawarra, 1970	9,500	30	32	5,342	1,949,775	52.0
	Toby, 1987	...	...	1	66	25,000	...
	Ulandi, 1985	5,200	3	3	93	96,000	40.4
	Wancoocha, 1984	6,000	4	6	585	1,274,000	44.0-54.0
	Watson, 1985	...	2	2	285	167,000	...
	Watson South, 1985	5,500	1	1	713	771,000	40.0
	Wilson, 1983	5,000	5	6	309	639,000	40.0
	Woolkina, 1982	9,700	...	1	...	...	51.5
	Yanda, 1984	8,000	...	1	43	56,000	40.0
WAPET GROUP	Barrow Island, 1964	1,200- 5,700	405	509	15,756	230,312,324	37.7
	Dongara, 1969	5,250- 5,577	1	9	107	966,274	35.5
WOODSIDE	North Rankin,(1) 1972	9,800	8	14	19,721	17,592,000	52.3
BRIDGE OIL LTD.	Boggo Creek, 1980	5,320	...	1	...	2,900	46.0
	Louise, 1986	5,910	1	2	68	79,137	58.0
	Narrows, 1986	5,739	1	1	25	18,138	60.0
	Taylor, 1988	5,538	5	5	339	123,722	47.0
	Thomby Creek, 1979	5,170	...	4	...	54,300	50.0
	Waggamra, 1978	7,670	1	1	7	13,011	55.0
	Yellow Bank Creek, 1982	5,180	2	2	44	356,584	52.0
COMMAND	Nockatunga ATP267P, 1983	3,310	3	5	165	294,499	48.0
	Kihee, 1986	3,200	1	2	1	813	44.7
	Koora, 1985	4,820	...	2	...	952	41.0
	Winna, 1985	3,300	1	2	65	104,036	45.8
	Thungo, 1986	3,345	4	4	281	211,370	46.8
	Maxwell, 1987	2,930	2	2	234	113,174	47.2
	Fairymount ATP377P, 1985	6,730	4	5	394	269,015	50.5
	Mindagabie ATP 246, 1987	5,290	1	1	2	658	40.3

		Name of field, discovery date	Depth, ft	No. of wells Producing	No. of wells Total	Production 1988 average B/d	Production Cumulative to Dec. 31, 1988 Bbl	°API gravity
	ESSO-BHP[d]	● Barracouta, 1965	4,550	2	2	374,206	2,527,700,130	62.8
		● Marlin, 1966	5,100	1	4			50.0
		● Kingfish, 1967	7,500	26	37			46.9
		● Halibut, 1967	7,700	10	17			43.3
		● Mackerel, 1969	7,700	18	18			45.6
		● Tuna, 1968	6,500	20	22			40.5
		● Snapper, 1968	4,350	16	21			47.0
		● Cobia, 1972	7,700	10	12			44.6
		● West Kingfish, 1968	7,500	15	18			46.9
		● Fortescue, 1978	7,700	23	25			43.0
		● Flounder, 1968	8,200	8	10			46.7
	STRATA OIL[e]	Woodada,[c] 1980	7,400	...	...			54.0
	WESTERN MINING CORP.[e]	North Herald, 1982	3,937	1	1			44.0
		South Pepper, 1982	4,036	1				44.0
		Total Australia		**951**	**1,221**	**516,500**	**2,926,807,713**	
AUSTRIA	RAG (MOBIL/SHELL)	Gaiselberg, 1938	5,200	33	67	734	32,395,600	27.0
		Kemating, 1979	6,100	8	9	865	3,991,466	34.0
		Sattledt, 1971	5,700	11	21	557	5,227,062	37.0
		Voitsdorf, 1963	7,000	17	39	507	21,754,560	36.0
		Other	...	53	130	1,289	26,567,780	32.0
	OEMV[e]	Hochleiten, 1977	3,100- 5,000	865	1,287	18,400	583,483,854	21.3
		Matzen, 1949	6,100					25.7
		Pirawarth, 1957	1,600- 6,500					28.4
		St. Ulrich, 1938	1,600- 4,300					31.1
		Total Austria		**987**	**1,553**	**22,352**	**673,410,322**	
BAHRAIN	BANOCO	Awali, 1932	1,850- 4,600	267	337	39,595	799,356,000	33.0
		Total Bahrain		**267**	**337**	**39,595**	**799,356,000**	
BARBADOS	BARB. NOC	Woodbourne, 1966	1,665- 6,701	85	135	1,166	5,017,389	27.2
		Total Barbados		**85**	**135**	**1,166**	**5,017,389**	
BENIN	ASHLAND	Seme, 1968	6,232	6	6	5,000	13,354,000	...
		Total Benin		**6**	**6**	**5,000**	**13,354,000**	
BOLIVIA	YPFB	Camiri, 1927	3,936	44	53	461	48,455,363	55.0
		Carand, 1960	3,940	30	37	373	54,250,639	60.0
		Colpa, 1961	9,184	15	15	162	18,227,969	65.0
		Espino, 1979	14,655	1	3	4	966,307	56.2
		H. Suarez R., 1982	7,820	1	9	33	486,560	35.0
		La Pena, 1965	8,856	24	30	5,006	26,806,382	43.0
		Monteagudo, 1966	4,592	25	29	1,547	32,097,267	41.0
		Palmar, 1964	10,758	5	6	81	1,716,183	65.0
		Rio Grande, 1961	9,512	37	37	2,180	60,764,321	62.0
		San Roque, 1981	7,170	6	7	813	715,421	71.0
		Santa Cruz, 1986	9,350	8	14	1,210	1,542,071	65.0
		Villamontes, 1987	9,770	3	5	736	425,887	57.0
		Vuelta Grande, 1978	8,220	8	14	1,607	2,380,333	67.0
		Cascabel, 1985	11,319	1	1	297	134,105	45.6
		Naranjillos, 1964	4,806	2	12	116	46,137	63.6
		Sirari, 1985	13,999	2	2	147	55,825	65.3
		Vibora, 1988	12,949	1	2	267	97,862	57.7
		Other	...	70	70	640	30,988,471	...
	OCCIDENTAL	Tita, 1976	6,450	7	15	126	4,378,711	67.9
		Porvenir, 1978	9,600	5	9	2,468	11,233,974	60.5
	TESORO BOLIVIA PETROLEUM CO.	La Vertiente, 1977	15,230	6	7	905	4,396,737	64.1
		Escondido, 1980	11,293	...	3	...	...	60.0
		Taiguati, 1981	10,174	...	1	...	...	63.0
		Los Suris, 1981	13,577	...	1	...	...	50.0
		Total Bolivia		**301**	**382**	**19,179**	**300,166,525**	
BRAZIL	ALAGOAS	Furado, 1969	4,440- 5,500	54	58	2,380	14,662,000	35.0
		● Mero, 1974	6,500- 7,400	...	...	...	151,000	35.0
		Pilar, 1981	4,100- 5,100	73	78	6,466	12,056,000	40.0
		Tabuleiro de Martins, 1957	3,900- 4,950	29	29	447	3,998,000	27.0
		Other	...	22	24	683	2,018,000	...
	AMAZONAS	Igarape Cuia, 1985	3,600- 3,700	...	...	...	25,000	41.0
		Rio Urucu, 1986	7,500- 8,300	3	5	238	87,000	44.0
	BAHIA	Agua Grande, 1951	820- 4,265	129	132	4,860	275,340,000	40.0
		Aracas, 1965	3,280- 8,856	170	173	6,380	111,508,000	41.0

	Name of field, discovery date	Depth, ft	No. of wells		Production		°API gravity
			Producing	Total	1988 average B/d	Cumulative to Dec. 31, 1988 Bbl	
	Buracica, 1959	1,476- 1,840	222	226	6,208	137,874,000	35.0
	Candeias, 1941	3,280- 7,415	36	36	2,510	78,300,000	30.0
	● Candeias Mar, 1941	3,300- 7,400	17	17	547	7,089,000	30.0
	Cassarongongo, 1959	1,475- 4,755	128	129	2,815	15,512,000	32.0
	Cexis, 1983	1,670- 5,230	22	23	2,175	3,792,000	30.0
	● Dom Joao Mar, 1947	920- 3,000	293	296	4,068	82,533,000	38.0
	Dom Joao Terra, 1947	920- 1,350	67	71	931	20,676,000	38.0
	Faz. Alvorada, 1983	2,100- 4,900	85	92	5,457	6,636,000	31.0
	Faz. Balsamo, 1983	2,500- 4,000	141	153	7,340	8,933,000	31.0
	Faz. Boa Esperanca, 1966	7,215- 8,036	26	26	1,117	15,498,000	39.0
	Faz. Imbe, 1964	2,130- 5,575	64	70	1,928	15,390,000	40.0
	Faz. Panelas, 1962	2,400- 5,100	14	15	382	6,554,000	37.0
	● Ilheus, 1979	1,500				895,000	41.0
	Malombe, 1966	3,280	18	21	396	6,969,000	41.0
	Mata/Remanso, 1971	4,445- 4,560	75	91	2,010	20,233,000	35.0
	Miranga, 1965	3,280- 3,936	224	232	9,045	190,215,000	40.0
	Riacho da Barra, 1982	2,910- 3,998	54	58	3,353	11,635,000	39.0
	Rio do Bu, 1984	2,900- 3,000	49	50	2,867	2,777,000	33.0
	Rio Dos Ovos, 1979	2,410- 3,750	13	16	329	2,021,000	35.0
	Rio Pojuca, 1982	5,600- 6,200	25	25	2,422	4,537,000	35.0
	Santana, 1962	2,400- 4,000	6	7	193	5,604,000	37.0
	Sesmaria, 1963	3,100- 4,600	32	39	686	3,097,000	40.0
	Taquipe, 1958	3,115- 3,935	107	408	4,095	85,738,000	40.0
	Other		168	175	3,805	22,300,000	
CEARA	● Atum, 1983	5,800- 6,750	9	10	3,383	7,950,000	25.0
	● Curima, 1978	6,888	15	17	4,801	18,796,000	32.0
	● Espada, 1983	5,750- 6,900	6	6	1,600	3,967,000	26.0
	Faz. Belem, 1980	1,150- 2,500	293	295	3,968	5,456,000	13.0
	● Xareu, 1977	5,717- 5,766	24	28	2,843	14,516,000	39.0
ESPIRITO SANTO	● Cacao, 1978	9,184	7	7	3,402	9,734,000	32.0
	Faz. Cedro, 1962	5,248	26	33	1,324	11,427,000	28.0
	Lagoa Parda, 1977	5,576	56	57	3,667	22,668,000	30.0
	Lagoa Piabanha, 1984	6,500	3	7	245	1,654,000	27.0
	Lagoa Suruaca, 1982	6,400	16	22	1,657	5,121,000	30.0
	Rio Itaunas, 1977	5,400	37	42	915	3,660,000	28.0
	Rio Preto/Oeste/Sul, 1976		36	40	771	2,090,000	
	Sao Mateus, 1969	5,750	68	80	1,458	5,518,000	27.0
	Other		75	78	3,443	3,254,000	
RIO DE JANEIRO	● Albacora, 1984	8,430	6	15	16,560	6,805,000	26.0
	● Anequim, 1981	8,200- 8,500	3	3	1,836	3,851,000	27.0
	● Area RJS-150					296,000	26.0
	● Area RJS-236 Trilha, 1983	8,800-11,000	2	4	3,432	10,347,000	28.0
	● Badejo, 1981	8,500-10,500	4	10	4,788	17,442,000	28.0
	● Bagre, 1983	8,700- 9,000	7	10	5,694	6,579,000	25.0
	● Bicudo, 1982	8,000-11,000	9	12	12,069	35,613,000	22.0
	● Bonito, 1977	6,950- 8,000	10	17	9,316	31,825,000	27.0
	● Cherne, 1982	9,900-10,200	24	24	33,157	52,087,000	27.0
	● Corvina, 1983	9,000-11,000	6	8	16,757	30,707,000	25.0
	● Enchova, 1976	6,973- 7,885	1	26	10,980	76,130,000	23.0
	● Garoupa, 1974	11,382	16	20	20,975	70,077,000	30.0
	● Garoupinha, 1974	12,693	3	4	3,786	11,798,000	30.0
	● Linguado, 1981	9,000-11,000	10	15	28,112	63,808,000	20.0
	● Marimba, 1983	8,900- 9,200	4	6	19,158	12,859,000	28.0
	● Moreia, 1984	8,200- 9,500	5	6	4,545	3,376,000	22.0
	● Namorado, 1975	10,083	26	42	58,851	120,452,000	28.0
	● Pampo, 1977	6,215	23	32	43,126	109,499,000	21.0
	● Parati, 1982	8,900- 9,200	3	5	1,220	5,159,000	25.0
	● Pirauna, 1982	8,000-10,500	8	9	15,926	26,770,000	27.0
	● Sul de Pampo, 1978	9,300- 9,600					20.0
	● Viola, 1981	9,200- 9,900	7	8	8,710	11,230,000	26.0
	● Carapeba		4	4	44	16,000	
	● Pargo		1	1	3	1,000	
RIO GRANDE DO NORTE	● Agulha, 1975	5,412	3	4	1,112	7,333,000	33.0
	Alto do Rodrigues, 1981	990- 1,120	289	302	3,757	7,216,000	18.0
	● Area 1-RNS-36, 1982					178,000	32.0
	Canto do Amaro, 1986	2,500- 3,600	263	270	18,163	9,181,000	25.0
	Estreito/Rio Panon, 1983	650- 820	441	449	4,931	10,224,000	16.0
	Faz. Pocinho, 1982	1,450- 2,000	186	202	4,195	10,199,000	35.0
	Guamare, 1983	1,400- 1,600	30	36	562	1,640,000	25.0
	Livramento, 1986	2,500- 3,300	29	33	4,044	3,800,000	41.0
	Lorena, 1984	1,200- 1,700	12	20	427	749,000	28.0
	● Macau-Mar, 1986	3,000	5	5	203	447,000	31.0
	Macau/Terra, 1982	3,000- 3,300	2	12	72	431,000	31.0
	Palmeiras, 1982	1,450- 1,800					25.0
	Serrania, 1982	3,200- 3,900	37	37	1,634	2,895,000	27.0
	● Ubarana, 1973	7,216- 8,365	85	89	15,418	52,788,000	40.0
	Upanema, 1985	1,110- 1,800	17	24	973	1,929,000	28.0
	Other		85	98	4,815	2,176,000	
PARÁ	● Area 1-PAS-11, 1983					421,000	41.0
MARANHÃO	São João, 1983	4,950- 6,200		5	8	75,000	40.0

		Name of field, discovery date	Depth, ft	No. of wells		Production		°API gravity
				Producing	Total	1988 average B/d	Cumulative to Dec. 31, 1988 Bbl	
	SERGIPE	Atalaia Sul, 1961	1,450	4	7	18	2,686,000	24.0
		Brejo Grande, 1967	1,670	13	13	457	1,933,000	26.0
		● Caioba, 1969	6,232- 6,890	10	12	2,131	30,351,000	36.0
		● Camurim, 1970	6,232	50	52	5,552	17,385,000	25.0
		Carmopolis, 1963	2,460	852	892	24,765	170,413,000	24.0
		● Dourado, 1970	3,620- 3,635	4	5	907	4,286,000	36.0
		● Guaricema, 1968	3,335- 4,430	12	12	3,995	36,484,000	41.0
		Riachuelo, 1961	1,475	240	245	3,693	21,850,000	28.0
		● Robalo, 1973	3,300- 4,500	4	5	27	828,000	30.0
		Siririzinho, 1967	1,640	186	196	5,177	36,297,000	30.0
		Other	...	88	94	1,528	4,064,000	...
		Total Brazil		**6,166**	**6,597**	**547,219**	**2,435,450,000**	
BRUNEI	SHELL	● Fairley, 1969	10,740	34	62	11,200	111,299,000	42.0
		● S. West Ampa, 1963	7,068- 8,155	114	267	38,520	529,598,000	41.0
		● Magpie, 1975	...	14	32	18,030	73,499,000	32.0
		Seria-Total, 1928		322	772	21,580	981,198,000	31.0
		● Champion, 1970	4,300	93	231	37,980	299,701,000	23.0
		Rasau, 1929		6	15	2,460	5,000,000	40.0
		Total Brunei		**583**	**1,379**	**129,770**	**2,000,295,000**	
BURMA(e)	MYANMA	Chauk-Lanywa, 1902	1,500- 4,000	450	450	15,000	495,175,000	36.0
		Mann, 1970	1,600- 7,000					37.5
		Myanaung, 1964	2,000- 4,000					40.5
		Prome, 1965	850- 5,000					36.0
		Yenangyaung, 1902	100- 6,700					36.0
		Total Burma		**450**	**450**	**15,000**	**495,175,000**	
CAMEROON(e)	ELF	● Betika, 1972	5,300	175	179	172,000	439,819,900	42.5
		Ekoundou S., 1975	6,200					24.0
		Koie, 1974	5,500					31.0
		Kombo Center, 1976	5,900					37.0
		Kombo North, 1978	7,200					35.0
		Ekoundou Horst plus Center, 1972	7,200					29.0
		Boa, 1976	5,900					35.0
		Bavo South, 1976	5,600					29.3
		Betika S. Marine, 1979	6,300					30.0
		Ekuondou N. Marine, 1977	5,250					36.0
		Mokoko NE plus Abana, 1977	4,600					29.0
		Asoma Marine, 1973	3,600					19.0
		Kita E. Marine, 1978	6,900					40.8
		Mokoko S. Marine, 1977	3,300					17.0
		Inova Marine, 1976	6,200					32.8
	TOTAL-CFP	● Moudi, 1979	5,250- 5,900					40.0
		● Moudi D., 1980	3,300					21.3
		Total Cameroon		**175**	**179**	**172,000**	**439,819,900**	
CANADA	ALBERTA	Acheson, 1950	3,390	59	120	19,564	127,226,625	38.0
		Bantry, 1940	2,574- 3,300	150	202	7,706	49,358,014	...
		Bellshill Lake, 1955	2,950	427	460	12,566	63,245,491	...
		Bonnie Glen, 1952	3,959- 6,779	142	169	17,750	502,601,208	34.0-44.0
		Carson Creek N., 1958	8,787- 8,935	40	71	9,466	140,412,051	44.0
		Cessford, 1950	2,800- 3,028	175	283	3,350	30,965,779	...
		Clive, 1951	6,074- 6,208	137	188	5,526	51,204,764	...
		Countess, 1951	2,858- 4,272	120	154	6,027	63,856,655	...
		Fenn-Big Valley, 1950	3,900- 5,400	130	312	9,682	315,762,910	32.0
		Gilby, 1962	4,201- 7,000	81	159	2,812	47,452,759	...
		Golden Spike, 1949	3,570- 5,961	57	83	2,140	181,744,170	36.0
		Grand Forks	...	319	401	22,994	90,380,719	...
		Harmattan East, 1954	6,358- 8,766	100	146	4,378	72,528,633	...
		Harmatton Elkton, 1955	8,796-10,757	64	81	4,423	62,063,117	...
		Hayter, 1968	2,030- 2,815	276	368	7,696	12,731,106	...
		Innisfail, 1956	6,730- 8,440	34	74	3,918	75,196,010	...
		Joarcam, 1949	3,179	184	288	5,433	102,248,430	...
		Joffre, 1953	4,983- 6,779	82	174	3,761	83,258,775	...
		Judy Creek, 1951	8,307- 8,701	188	269	19,727	395,485,344	43.0
		Kaybob, 1957	4,870- 9,577	66	99	5,202	102,532,956	...
		Kaybob S., 1958	5,600-10,042	67	101	8,481	79,550,035	...
		Leduc-Woodbend, 1947	3,062- 5,380	331	730	4,471	376,834,573	40.0
		Lloydminster, 1933	1,690- 1,945	424	896	5,943	49,375,747	...
		Medicine River, 1954	5,435- 7,600	254	375	11,064	71,372,450	...
		Mitsue, 1964	5,908	270	408	29,906	282,209,383	43.0
		Nipisi, 1965	5,648- 5,726	271	355	31,168	274,989,069	41.0
		Pembina, 1953	3,000- 6,133	3,415	4,180	102,312	1,241,602,303	32.0-37.0
		Provost, 1946	2,760- 2,898	1,158	1,674	26,894	80,231,351	...
		Rainbow, 1965	4,994- 6,160	255	356	44,915	514,095,494	38.0-42.0
		Rainbow South, 1965	6,102- 6,400	51	80	6,023	64,268,448	...
		Red Earth, 1956	4,184- 4,878	190	287	5,299	37,964,546	...

		Name of field, discovery date	Depth, ft	No. of wells Producing	No. of wells Total	Production 1988 average B/d	Production Cumulative to Dec. 31, 1988 Bbl	°API gravity
		Redwater, 1948	2,012- 3,200	583	862	14,439	789,353,382	35.0
		Simonette, 1958	10,500	33	51	2,305	38,211,164	...
		Snipe Lake, 1962	8,500	41	97	4,032	54,049,733	...
		Sturgeon Lake S., 1953	4,912- 8,471	89	149	15,927	142,839,903	...
		Sundre, 1954	8,700- 9,000	58	77	3,382	37,029,438	...
		Swan Hills, 1957	8,100	596	835	39,378	681,522,132	40.0
		Swan Hills S., 1959	8,400	172	199	16,252	344,427,758	...
		Taber N., 1966	3,110- 3,270	90	123	5,721	14,839,846	...
		Turner Valley, 1913	3,100- 9,150	109	158	2,710	139,918,237	39.0
		Utikuma Lake, 1963	5,624	112	146	12,497	47,954,559	...
		Valhalla, 1973	1,815- 7,060	118	192	7,377	10,780,316	...
		Virginia Hills, 1957	9,210	125	180	16,385	147,963,375	34.0
		Wainwright, 1925	1,903- 2,200	606	763	9,645	69,092,776	...
		Westerose, 1952	6,818	35	42	13,313	130,390,221	...
		Westpem	...	10	13	10,781	25,819,017	...
		Willisden Green, 1956	5,157	470	821	8,541	117,182,172	...
		Wizard Lake, 1951	4,044- 5,973	42	47	11,124	322,516,443	...
		Zama, 1966	3,702	133	246	5,964	75,573,948	33.0-37.0
		Other	...	8,328	13,002	340,887	1,480,770,744	...
	BRITISH COLUMBIA	Boundary Lake, 1957	3,418- 4,575	279	355	10,557	171,682,084	40.0
		Eagle West, 1976	2,170- 3,940	40	82	6,568	26,927,191	...
		Other	...	354	781	15,234	233,736,322	...
	MANITOBA	All fields	...	1,370	1,604	13,214	166,122,510	...
	SASKATCHEWAN	Steelman, 1950	4,600	661	730	9,166	255,349,449	...
		Weyburn, 1955	4,600	795	873	17,185	287,187,137	...
		Other	...	12,460	16,918	184,260	1,714,934,051	...
	ONTARIO	All fields	...	1,170	1,545	3,277	62,248,839	...
	NEW BRUNSWICK	All fields	...	2	2	6	805,261	...
	NORTHWEST TERRITORIES	All fields	...	159	159	30,054	65,571,707	...
		Total Canada		**38,557**	**54,577**	**1,280,778**	**13,297,548,630**	
CHILE	**ENAP-MAINLAND**	Canadon, 1962	6,090	12	62	233	14,553,556	38.4
		Daniel, 1960	5,806	7	121	131	34,482,282	25.4
		Daniel Este, 1961	5,523	10	66	291	28,417,463	25.0
		Dungeness, 1962	5,251	4	19	257	4,008,542	28.6
		Posesion, 1960	5,622	37	76	721	21,438,832	63.6
		Faro Este, 1959	7,381	5	25	173	3,292,608	35.0
		Delgada Este, 1958	7,694	9	31	187	4,863,894	35.0
		Other	...	17	118	1,980	14,888,613	...
	TIERRA DEL FUEGO	Calafate, 1955	6,045	16	61	699	25,815,946	49.3
		Catalina, 1956	5,756	8	26	776	6,487,153	38.7
		Catalina Sur, 1961	5,779	3	43	23	6,368,730	44.0
		Cullen, 1954	5,730	15	106	353	41,108,599	41.8
		Gorrión, 1986	6,025	6	10	1,006	741,719	39.0
		San Sebastián Norte, 1986	6,870	3	4	136	137,329	37.0
		Tres Lagos, 1957	5,724	21	84	376	15,963,114	40.1
		Chañarcillo, 1951	7,404	2	17	58	7,225,639	58.2
		Sombrero, 1951	7,126	2	23	54	13,107,778	40.2
		Victoria Sur, 1950	7,431	2	34	53	7,857,791	41.1
		Other	...	44	255	1,531	30,200,008	...
	STRAIT OF MAGELLAN	Daniel Este-Dungeness, 1977	6,126	24	36	2,041	4,166,209	35.9
		Jaiba, 1978	6,650	3	3	606	245,751	46.5
		Ostion, 1977	7,156	15	18	976	8,079,390	33.0
		Pejerrey, 1984	7,229	31	75	3,243	9,454,583	39.0
		Posesion, 1977	6,727	12	39	567	5,376,027	34.5
		Spiteful, 1977	6,298	24	82	3,921	42,441,789	34.5
		Spiteful Norte, 1978	7,150	13	55	775	9,495,220	39.0
		Skúa, 1988	5,932	25	25	3,230	1,175,891	32.0
		Total Chile		**370**	**1,514**	**24,397**	**361,394,456**	
CHINA(e)	**WESTERN REGION: JUNGGAR BASIN, TARIM BASIN, TURPEN BASIN**	Karamay, 1955						
		Dushanzi, 1941						
		Other						
	CENTRAL REGION: JIUQUAN BASIN	Yumen, 1938						
	CENTRAL REGION: SICHUAN BASIN	All fields						
	CENTRAL REGION: SHAN-GAN-NING BASIN	Chang Qing, 1978						
		Yanchang, 1907						
	CENTRAL REGION: QAIDAM BASIN	Qinghai, 1955						
		Lenghu 3,4,5, 1958						
		Other						
	EASTERN REGION: SONGLIAO BASIN	Daqing, 1959		43,700	NA	2,733,000	13,695,791,000	
		Fuyn, 1958						
		Jilin, 1978						
	EASTERN REGION: BOHAI BASIN	Shengli, 1962						
		Renqiu, 1975						

		Name of field, discovery date	Depth, ft	No. of wells Producing	No. of wells Total	Production 1988 average b/d	Production Cumulative to Dec. 31, 1988 bbl	°API gravity
		Liaohe, 1964	...	...	...			—
		Dagang, 1964	...	...	...			—
		Zhongyuan, 1981	...	...	...			—
		Itu, 1970	...	—	—			—
	EASTERN REGION: JIANGHAN BASIN	Qianjiang, 1966	—	—	—			—
		Other	—	—	—			—
	EASTERN REGION: NANXIANG BASIN	Nanyang, 1971	—	—	—			—
	EASTERN REGION: SUBEI BASIN	All fields	—	—	—			—
		Total China		**43,700**	**NA**	**2,733,000**	**13,895,791,000**	
CHINA, TAIWAN	CHINESE PETROLEUM	• CBK, 1986	—	4	9	837	22,715,347	47.0
		Chingtsohu, 1967	—	7	14	82		50.0
		Chuhuangkeng, 1960	—	28	28	224		50.0
		Tiechengshan, 1959	—	21	31	1,027		51.0
		Yunghoshan, 1971	—	23	34	288		45.0
		Total China, Taiwan		**83**	**116**	**2,458**	**22,715,347**	
COLOMBIA	ECOPETROL(e)	Galán, 1945	3,200	62	71	142,442	2,139,897,054	19.0
		Infantas, 1918	3,200	263	307			25.8
		La Cira, 1925	3,250	612	703			24.0
		Lis-Nutria, 1957	9,500	130	137			31.0
		Llanito, 1960	7,300	60	61			21.0
		Cantagallo, 1941	6,800	11	13			19.7
		Casabe, 1941	3,800	330	416			20.7
		Yarigui, 1954	8,700	58	59			19.5
		Boquete, 1961	8,000	12	20			43.0
		Cicuco, 1956	—	5	22			—
		Petrolea, 1933	—	6	21			—
		Tibú, 1940	—	189	261			—
		Ortega, 1951	—	6	6			28.0
		Apiay, 1981	10,500	9	22			23.0
		Orito, 1963	6,600	58	95			40.0
		Other	—	129	215			—
	ARGOSY(e)	Bourdine, 1974	11,000	2	4			26.7
		Máxime, 1976	11,000	1	1			11.0
		Nancy, 1974	11,000	1	1			26.0
	HOCOL SA (SHELL)(e)	Palogrande, 1971	6,500	32	36			20.0
		Pijao, 1981	7,000	6	7			21.0
		San Francisco, 1985	2,800	41	41			27.0
		Hato Nuevo, 1984	6,900	2	4			36.0
		Tenay, 1985	11,500	3	3			36.3
		Santa Clara, 1987	2,100	5	6			19.0
		La Jagua, 1986	5,300	2	2			22.0
		Loma Larga, 1985	3,500	1	1			22.4
		Brisas, 1973	4,200	4	6			23.5
		Dina T, 1962	3,600	51	64			20.0
		Dina K, 1969	6,500	22	26			22.0
		La Canada, 1966	700	5	7			22.0
		Tello, 1972	7,500	30	34			22.0
		Cebu, 1981	6,500	8	10			19.0
	ESSO COLOMBIANA LTD.	Arauca, 1980	18,000	3	43	2,170	5,265,638	41.0
		Bonanza, 1963	4,000	13	17	777	13,011,115	30.0
		Provincia, 1962	8,000	130	179	14,599	161,516,411	33.0
	ELF AQUITAINE	Barquerena, 1982	9,300	3	3	1,180	2,813,434	32.3
		Cano Garza, 1979	7,900	3	3	991	1,291,027	40.2
		Cano Garza Norte, 1983	7,900	2	2	847	1,675,114	40.2
		Cravo Este, 1987	11,376	—	1	—	3,481	42.0
		Cravo Sur, 1982	10,600	2	2	1,382	2,295,295	40.2
		Gloria Norte, 1983	12,100	1	1	856	863,623	17.2
		Tocaria, 1980	13,500	1	2	734	916,671	32.1
		Trinidad, 1974	9,000	3	3	1,993	3,707,997	32.4
	OCCIDENTAL	Caño Limón, 1983	7,600	43	50	163,099	167,197,220	29.0
		Cano Yarumal, 1987	7,600	1	1	429	156,541	29.0
		La Salina, 1936	2,500	38	71	2,527	13,360,549	28.0
		Payoa, 1962	8,000	17	39	971	69,674,340	27.0
		Redondo, 1984	7,600	3	4	9,956	3,925,822	30.2
	TEXACO	Cocorná, 1963	2,100	47	54	2,017	13,909,437	12.0-13.0
		Tisquirama, 1963	8,000	6	6	428	4,825,054	16.0-28.0
		Velasquez, 1946	7,500	108	144	3,669	166,099,429	19.0-24.0
	TEXACO-ECOPETROL	Los Angeles, 1983	6,400	3	5	521	541,565	14.0-15.0
		Nare, 1981	2,100	7	7	111	277,877	11.0-12.0
		Teca, 1981	2,100	176	186	14,003	24,774,825	12.0-13.0
	CHEVRON	Castilla, 1969	6,500	16	17	12,225	24,857,349	13.5
		Chichimene, 1969	8,400	1	1	566	600,251	21.3
	LASMO	Santiago, 1985	9,600	2	2	1,482	1,260,143	29.0
		Total Colombia		**2,785**	**3,486**	**379,975**	**2,824,717,262**	

		Name of field, discovery date	Depth, ft	No. of wells Producing	No. of wells Total	Production 1988 average B/d	Production Cumulative to Dec. 31, 1988 Bbl	°API gravity
CONGO	AGIP	● Loango, 1972	3,000	52	62	8,559	84,624,090	26.8
		Zatchi	1,980	8	8	2,700	283,464	25.9
	ELF CONGO	● Emeraude, 1969	820	87	97	21,800	168,000,000	21.8
		Kunji, 1980	4,000	2	2	110	540,000	35.8
		● Likouala, 1979	4,270	28	42	17,100	57,200,000	33.1
		Mengo, 1979	6,500	3	3	150	690,000	34.0
		Pointe Indienne, 1951	5,000	3	3	155	7,060,000	36.9
		● Sendji, 1973	3,940	50	75	31,100	55,000,000	30.1
		● Tchibouela, 1983	2,110	28	30	33,600	9,700,000	28.0
		● Yanga, 1979	2,950	49	65	19,400	69,000,000	29.4
		Total Congo		**310**	**387**	**134,674**	**452,097,554**	
DENMARK	DUC	● Dan, 1971	6,000- 6,400			25,748	48,008,127	30.7
		● Gorm, 1971	6,500- 7,000			23,283	75,565,967	34.7
		● Rolf, 1981				6,804	9,426,050	37.7
		● Skjold, 1977	5,000			23,552	35,123,505	29.6
		● Tyra, 1986				16,388	17,508,725	56.6
		Total Denmark		—	—	**95,775**	**185,632,374**	
DUBAI(e)	DUPETCO	● Fateh, 1966	7,900- 9,000					31.8
		● S.W. Fateh, 1970	7,500- 9,000					30.3
		● Falah, 1972	8,100	141	156	355,100	2,052,741,600	25.5
		● Rashid, 1973	9,400-11,500					38.0
	ARCO	Margham, 1981	11,200	9	14			43.5
		Total Dubai		**150**	**170**	**355,100**	**2,052,741,600**	
ECUADOR	TEXACO-CEPE	Aguarico, 1968	9,850	5	10	5,008	44,185,837	27.2
		Atacapi, 1968	9,855	4	6	1,621	12,160,543	31.0
		Auca, 1970	10,578	23	25	16,866	71,041,688	28.0
		Auca Sur, 1980	9,100-10,300	2	2	745	1,410,759	25.6
		Cononaco, 1972	11,233	11	11	14,554	26,070,228	33.3
		Culebra, 1973	10,626	2	2	1,261	2,170,011	17.5
		Dureno, 1968	10,290	1	1	721	930,152	31.0
		Guanta, 1968	9,575	9	9	8,059	4,805,469	24.7
		Lago Agrio, 1967	10,175	20	38	10,196	111,606,831	28.5
		Parahuacu, 1968	10,173	4	5	876	6,357,163	30.0
		Rumiyacu, 1982	10,191		1		1,595,844	21.0
		Sacha, 1969	10,160	91	113	66,831	362,314,028	28.0
		Shushufindi, 1959	9,772	52	80	105,144	533,214,866	30.0
		Yuca, 1970	10,423	5	10	3,227	11,373,294	28.0
		Yuca Sur, 1979	9,600-10,000	1	1	640	1,114,809	14.5
		Yulebra, 1980	8,800-10,000	3	3	2,069	2,950,663	24.3
	CLYDE PETROLEUM	Fanny, 1972	7,700	8	8	5,382	11,190,095	22.5
		Mariann, 1971	7,700	5	5	1,158	3,920,460	20.0
		Tarapoa, 1973	8,300	1	2	325	1,029,262	20.0
	CEPE-ORIENTE(e)	Shushuqui, 1980	9,200	6	6			28.8
		Shuara, 1980	9,100	8	8			29.6
		Secoya, 1980	9,100	15	15			30.3
		Charapa, 1967	10,000	12	12	60,317	199,709,257	30.0
		Cuyabeno, 1972	8,050	4	4			28.8
		Sansahuari, 1979	8,100	1	1			28.8
		Tetete, 1980	9,300	5	5			28.0
		Bermejo, 1967	5,000	9	9			34.0
	CEPE-PENINSULA(e)	Ancon, 1921	4,000	475	475			35.6
		Carpet	—	70	70			—
		Cautivo	—	100	100			—
		Total Ecuador		**952**	**1,037**	**305,000**	**1,409,151,259**	
EGYPT	GUPCO/AMOCO	Abu Gharadig, 1972	9,500	17	27	12,973	54,670,000	35.0-55.0
		● Badri (315), 1981	6,400	21	37	38,988	56,955,000	27.0-28.0
		● El Morgan, 1965	5,100- 6,400	112	131	103,852	1,048,550,000	27.0-32.0
		● GH (376), 1981	8,200- 9,750	1	5	743	6,047,000	24.0-28.0
		● GS (277) 1980	8,610	1	1	1,712	2,851,000	34.0
		● GS (345/346), 1982	7,500	1	2	1,174	1,189,000	35.0-38.0
		● GS (365), 1980	10,140	1	1	200	565,000	42.0
		● GS (381), 1985	8,700		1		924,000	37.0
		● GS-327, 1983	5,600	1	1	193	2,076,000	20.0
		● Hilal (404), 1982	9,200-10,000	7	9	26,514	46,308,000	32.0
		● July, 1973	8,100-10,000	34	45	57,493	472,067,000	33.0
		NAG-9/9-1, 1985	10,000	1	2	862	1,301,000	35.0
		NEAG-9/15, 1984	10,635-12,128	1	1	305	830,000	35.0
		● Nessim (336), 1981	6,700	1	3	391	8,867,000	29.0
		● October, 1978	11,000	23	32	121,134	343,135,000	27.0-31.0
		● Ramadan, 1974	11,400	24	28	46,710	379,152,000	30.5
		Razzak and E. Razzak, 1972	5,730- 7,710	12	19	3,302	52,141,000	38.0

				No. of wells		Production		
		Name of field, discovery date	Depth, ft	Producing	Total	1988 average B/d	Cumulative to Dec. 31, 1988 Bbl	°API gravity
		● SB (305), 1981	8,100	1	1	53	2,044,000	27.0
		● SB (339), 1981	4,600	1	1	345	699,000	29.5
		● SB (367), 1984	7,500	1	1	193	1,255,000	39.0
		● SB-294, 1986	11,600	1	1	946	1,039,000	30.5
		● SG-300, 1976	5,876- 6,200	3	4	6,805	20,203,000	24.0
		● Shoab Ali, 1978	4,700- 5,500	13	47	8,869	129,500,000	28.0-33.0
		● Sidki (382), 1977	10,500	5	7	6,903	40,702,000	34.0
		● Waly (356), 1982	6,900	1	3	2,621	3,936,000	36.0
		WD-33, 1972	9,700	1	1	139	2,162,000	35.0
		WD-33/15, 1985	5,800	2	2	862	1,574,519	30.0
		● Younis (347), 1981	4,300	3	6	5,487	13,991,000	32.0
		● SB-374,1981	10,200	...	1	147	68,506	30.0
	AGIP	● Belayim Land + Minori, 1954	7,000- 8,500	99	106	39,136	427,998,357	22.5
		Belayim Marine, 1961	8,500	57	67	143,516	609,919,209	29.5
		Meleiha, 1972	5,950	40	42	13,892	10,241,963	41.6
	WEPCO/PHILLIPS PETROLEUM	El Alamein, 1966	8,700	17	19	1,900	66,876,245	33.6
		Umbarka, 1976	10,700	4	5	2,692	6,696,236	43.9
		Yidma, 1971	9,000	3	5	344	21,885,882	44.0
	SUESSO (ESSO)	● East Zeit, 1982	11,000	6	6	15,618	14,766,080	38.0
	KHALDA	Hayat, 1986	9,000	3	3	685	426,693	40.0
		Khalda, 1983	7,000	6	11	2,570	1,759,634	35.0
		Safir, 1986	12,000	1	1	482	215,387	36.0
		Safir North, 1986	11,600	3	3	2,071	893,519	36.0
		Tut, 1986	9,000	4	4	1,663	642,712	35.0
		Tut West, 1988	9,000	1	1	189	68,791	35.0
	BADR PETROLEUM/SHELL	Badr el din, 1982	10,800	10	10	17,910	22,255,000	38.0
	SUCO	● Ras Budran, 1978	12,500	17	20	37,000	74,100,000	23.0-24.0
		● LL 87-2, 1975	12,000		1		74,000	34.0
		● Ras Fanar, 1978	3,000	5	6	18,000	26,500,000	30.0
		● Zeit Bay, 1981	6,000	22	32	54,000	100,000,000	34.5
	OSOCO/TOTAL(e)	● Shukheir Bay, 1978	6,300	1	1			34.5
		● S. Ramadan, 1982	10,000	2	2			36.5
	GEYSUM(e)	● Geysum, 1980	5,500	5	5			17.0
	GPC(e)	Gharib, 1938	2,200- 4,500	81	215			24.3
		Bakr/W. Bakr, 1958/1978	3,200- 1,500	48	83			18.0-19.0
		Umel Yusr, 1968	3,000- 3,300	19	37			21.5
		Amer, 1965	3,500	21	39			21.5
		El Ayoun, 1968	3,300	5	12			22.0
		Kareem, 1958	2,300	6	35			16.6
		Kheir, 1973	1,050	1	4			28.5
		Shukheir, 1966	2,500	5	11			34.0
		Ras El Behar, 1983	4,500	6	11			32.5
		Esh Elmalaha	3,700	2	2			44.0
		Sudr, 1946	2,600	12	20			21.6
		Asl, 1947	3,000	3	6			21.6
		Matarma, 1948	2,000	2	2	32,890	544,931,000	14.6
		El Khaligue, 1980	1,600		1			29.4
		Abu Senan T&Y, 1981	6,000	12	20			
		Harghada, 1913		NA	NA			
	EPEDECO(e)	West Bakr, 1978	1,300- 1,500	20	25			18.0
	EGYPTCO(e)	Meleha, 1972	6,000	12	12			40.0
	SHUKAIR MARINE CO.(e)	O. Suco		1	1			
	EL ALAMEIN(e)	Mors		1	1			
		Total Egypt		**874**	**1,335**	**848,000**	**4,635,518,615**	
FRANCE	**ALSACE**	All fields		19	28	337	3,052,456	
		Abandoned					24,337,343	
	AQUITAINE BASIN	Castera-Lou, 1976	9,600	7	11	394	2,474,744	21.7
		Cazaux, 1959	7,550	34	72	4,651	69,481,736	34.2-37.3
		Lacq Superieur, 1949	2,170	43	71	809	25,859,775	22.3
		Lagrave, 1984	6,500	3	3	4,817	5,824,244	42.5
		Lavergne, 1962	11,480	4	6	343	12,271,809	41.7
		Lugos, 1956	5,250	16	26	537	10,129,561	20.8
		Parentis, 1954	7,710	48	100	5,123	197,990,777	33.4
		Pecorade, 1974	10,660	7	20	2,446	9,937,269	29.3
		Vic Bilh, 1979	7,100	27	47	5,105	16,610,984	26.6
		Other		7	12	215	10,310,398	
		Abandoned					8,848,690	
	PARIS BASIN	Chateaurenard, 1958	1,800	26	47	414	4,885,814	27.5
		Chaunoy, 1983	7,350	52	74	16,281	22,100,255	37.1
		Chuelles, 1961	1,800	30	68	388	6,999,179	27.5
		Coulommes, 1958	6,230	28	49	365	13,346,852	32.6
		Donnemarie, 1979	8,040	2	7	613	2,052,414	36.2
		Soudron, 1976	4,600	17	30	433	2,083,871	34.4

		Name of field, discovery date	Depth, ft	No. of wells — Producing	No. of wells — Total	Production — 1988 average B/d	Production — Cumulative to Dec. 31, 1988 Bbl	°API gravity
		St. Firmin, 1960	1,800	33	62	458	9,967,266	27.5
		St. Germain, 1984	7,200	9	15	1,377	1,937,207	36.0
		St. Martin, 1959	4,590	9	17	299	8,460,522	33.0
		Vert-le-Grand, 1986	6,230	5	6	2,052	1,246,080	34.8
		Villeperdue, 1959	6,100	95	136	14,601	16,778,600	34.4
		Fontaine-au-Bron, 1986	6,140	8	8	1,185	534,606	35.4
		Champotran, 1985	8,400	7	13	920	561,351	31.1
		Other	...	72	216	3,458	13,089,240	...
		All fields abandoned	...	...	...	...	14,030,310	...
	SOUTHEAST + JURA	All fields abandoned	...	...	...	...	223,063	...
		Total France		**608**	**1,144**	**67,621**	**515,426,416**	
GABON	ELF(a)	● Anguille, 1962	9,200	218	305	107,345	946,128,270	31.2
		● Anguille W, 1968	7,500					32.0
		● Anguille SE, 1962	8,200					33.0
		● Ayol Marine, 1979	7,700					22.8
		● Baliste, 1974	4,900					28.3
		● Barbier, 1972	6,000					29.5
		● Batanga, 1960	5,900					39.2
		● Baudroie Marine, 1968	7,500					29.7
		● Baudroie N., 1980	7,500					31.5
		● Breme, 1976	5,000					37.0
		● Clairette, 1956	4,400					32.5
		● Dorée, 1972	7,300					30.4
		● Cirelle, 1973	9,400					25.7
		● Gonelle, 1972	5,800					25.7
		● Grand-Anguille, 1963	8,400					31.1
		● Grondin, 1971	7,500					26.6
		● Konzi, 1962	3,600					39.0
		● M'Bya Sud, 1969	6,700					36.2
		● Mandaros, 1972	4,900					20.5
		● Merpi(Sardomg. 1091	9,999					30.2
		Olende, 1976	6,700					34.0
		● Pageau, 1972	11,500					19.8
		● P.G.S. Marine, 1975	7,500					31.2
		Tchengue, 1957	4,100					31.0
		● Tchengue-Océan, 1962	6,600					30.2
		● Torpille, 1968	8,200					34.0
		● Torpillo NE, 1968	8,200					32.3
	SHELL GABON	Gamba/Ivinga, 1963	3,000- 3,100	51	84	11,750	258,701,000	31.6
		Lucina-Marine, 1971	5,900	15	22	7,920	51,199,000	38.4
		Lucina-Marine W., 1982	...	...	...	820	1,900,000	38.4
		Lucina-Marine SE, 1971	...	...	...	2,200	805,000	37.0
	AMOCO	Oguendjo B and C, 1981	5,000- 6,000	19	19	16,601	33,300,000	36.0
	BRITISH GAS	● Obando, 1984	8,650	2	2	2,206	805,000	32.0
		● Octopus, 1984	10,300	3	3	2,532	924,000	33.0
		● Pelican, 1985	9,300	4	4	8,967	3,273,000	31.0
		Total Gabon		**312**	**439**	**160,341**	**1,297,035,270**	
GHANA	AGRI-PETCO	● Saltpond, 1977	8,500	...	3	...	3,938,000	36.0-39.0
		Total Ghana		...	**3**	...	**3,938,000**	
GREECE	N. AEGEAN PET. CORP.	● Prinos, 1974	8,000- 8,800	11	14	22,457	63,700,000	28.5
		Total Greece		**11**	**14**	**22,457**	**63,700,000**	
GUATEMALA	MEM*	Caribe, 1981	6,830	3	3	1,274	2,650,639	22.0-24.0
		Rubelsanto, 1974	5,300	7	8	1,234	5,796,391	26.0-30.0
		San Diego, 1981	17,150	...	1	63	135,865	34.7
		Tierra Blanca	11,230	...	...	...	176,113	19.5
		Tortugas, 1973	2,300	...	...	...	67,800	35.0
		West Chinaja, 1977	3,200- 3,800	3	3	903	7,125,411	35.0-43.0
		Xan, 1985	8,427	1	1	254	128,782	17.5
		Total Guatemala		**14**	**16**	**3,728**	**16,081,001**	
INDIA	GUJARAT STATE	Ankleshwar, 1960	1,969- 6,564	138	225	20,963	442,939,000	45.0
		Gandhar, 1984	9,846-12,145	30	43	9,023	3,831,000	47.0
		Kadi, N., 1967	3,610- 7,220	160	200	14,743	6,630,000	21.0
		Kadi, S., 1968	6,892- 9,846	6	11	494	3,578,000	24.0
		Kalol, 1961	4,595-10,830	152	195	8,601	42,190,000	38.0
		Nawagam, 1963	4,595-10,174	74	109	2,668	25,835,000	31.0
		Sanand, 1962	4,267-10,174	22	34	2,670	9,552,000	26.0
		Sobhasan, 1968	4,595- 9,846	59	104	9,349	21,167,000	26.0-40.0
		Viraj, 1978	4,595- 4,923	20	35	2,655	3,797,000	20.0

*Ministerio de Energia y Minas

	Name of field, discovery date	Depth, ft	No. of wells Producing	No. of wells Total	Production 1988 average B/d	Production Cumulative to Dec. 31, 1988 Bbl	°API gravity
ASSAM STATE	Geleki, 1968	9,518-14,769	70	101	9,856	27,241,000	30.0
	Lakwa-Lakhmani, 1964	6,564-14,113	191	233	39,632	140,811,000	33.0
	Rudrasagar, 1960	7,877-13,128	53	59	10,612	33,806,000	25.0
WEST COAST	B-38 (Heera), 1977	4,267- 6,564	35	35	32,025	45,854,000	37.0
	• Bombay High, 1974	3,282- 7,877	254	254	408,569	1,102,525,000	39.0
	Panna (North Bassein), 1976	4,923- 7,549	7	7	1,198	604,000	38.0
NAGALAND	Changpang, 1973	8,861-10,502	7	11	2,823	3,761,000	34.0
TAMIL NADU	Narimanam, 1985	6,236- 7,549	5	11	560	229,000	29.0-45.0
OTHER FIELDS	Bakrol, 1966	2,626- 9,846	...	3	...	37,000	...
	Digboi, 1980	300- 7,500	239	696	548	74,250	...
	Kathana, 1965	5,250- 5,906	13	22	540	4,903,000	25.0
	Kholka, 1966	5,579- 7,877	12	5	81	584,000	...
	Kosamba, 1963	1,313- 8,533	6	9	454	834,000	...
	Moran, 1958	11,000	62	89	8,150	93,900	...
	Nakhorkatiya, 1953	9,500	134	269	15,573	303,880	...
	Wavel, 1962	4,595- 7,220	...	...	...	168,000	...
	Jorajan, 1967	7,000-11,500	117	176	16,645	39,500	25.0-34.0
	Total India		**1,866**	**2,936**	**618,432**	**1,921,387,530**	
INDONESIA PERTAMINA UEP I(e)	Besitang, 1977	3,973	204	226	134,454	2,952,389,683	51.5
	Gebang, 1977	2,917					54.0
	K. Simpang, 1971	3,740- 5,019					45.0
	P. Tabuhan, 1937	3,350- 5,893					50.8
	Rantau, 1929	2,764					45.3
	Serang Jaya, 1926	3,701					47.5
PERTAMINA UEP II(e)	Benuang, 1942	6,103	412	1,419			35.1
	Benakat East, 1973	NA					NA
	Tempino, 1931	1,647					23.0
	Gn. Kemala, 1938	5,448					38.0
	Limau, 1928	3,896- 4,626					NA
	Ogan Timur, 1943	3,793					27.42
	Talang Jimar, 1937	4,123					31.0
	T. Miring, 1935	640					NA
	Tanjung Tiga, 1938	3,750					28.0
	Kenali Asam, 1931	2,077					29.0
	Belimbing	5,371					...
	Kuang, 1940	5,249					25.1
PERTAMINA UEP III(e)	Cemara, 1976	3,964- 7,104	88	184			...
	Jatibarang, 1969	3,063					29.0
	Tugu Barat, 1979	3,014					...
PERTAMINA UEP IV(e)	Bunyu, 1923	2,077	161	334			33.2
	Sangatta, 1939	1,842					33.0
	Tanjung, 1938	2,296					39.9
	Tapian Timur, 1967	4,396					38.8
	Warukin S., 1966	2,067					26.9
PERTAMINA UEP V(e)	Klamono, 1936	574	47	55			19.0
	Linda, 1977	3,281					19.0
	Sele, 1951	2,156					35.0
PERTAMINA (FROM STANVAC)(e)	Sago, 1940	1,800	354	354			34.0
	Lirik, 1939	1,600					34.0
	Molek, 1956	2,600					34.0
	N. Pulai, 1941	1,800					34.0
	S. Pulai, 1941	1,800					34.0
	Talang Akar, 1922	2,800					35.0
	Benakat, 1932	1,600					35.0
	Jirah, 1930	2,300					35.0
	Rajah, 1940	6,000					38.0
	Abab, 1951	6,000					36.0
PERTAMINA (N.E. KALIMANTAN)(e)	Sembakung, 1976	2,600	17	19			36.0
	Bangkudulis, 1980	3,250	...	1			39.5
PERTAMINA (FROM PHILLIPS)(e)	Salawati, 1976	5,749	7	13			39.2
LEMIGAS(e)	All fields, 1893-1909	2,155- 2,297	71	419			...
TOTAL CFP(e)	• Tambora, 1980	8,000-13,000	15	34			33.0
	• Handil, 1974	2,900- 9,000	219	272			33.0
	• Bekapai, 1972	4,600- 5,600	42	45			40.0
ARCO	Ardjuna, 1969	2,380- 7,250	270	317	121,975	683,283,000	37.0
	Arimbi, 1972	2,943	20	30	10,248	26,331,000	33.0
	NWC, 1974	5,411-5,800	14	15	6,027	5,053,000	31.5
	Bima, 1983	3,000- 3,888	35	50	13,790	1,536,000	34.0
AGL PETROLEUM (SERAM) LTD.	Bula, 1897	280- 1,300	123	63	1,252	15,090,196	23.0
CHEVRON & TEXACO	Batang, 1975	690	12	13	593		19.0
	Buaya, 1978	2,035	...	2	...		28.0
	Lindai, 1971	1,100	18	20	1,581		32.0
	Menggala S., 1968	3,765	2	3	906		34.0

	Name of field, discovery date	Depth, ft	No. of wells Producing	No. of wells Total	Production 1988 average B/d	Production Cumulative to Dec. 31, 1988 Bbl	°API gravity
	Tanjung Medan, 1976	2,770	2	7	657		34.0
	Benua, 1978	2,400	19	22	7,247		37.0
	Beruk, 1974	1,750	19	25	9,693		38.0
	Beruk NE, 1976	1,800	3	5	281		40.0
	Beruk North, 1985	1,900	4	5	1,061		38.0
	Bungsu, 1976	2,050	7	8	1,262		38.0
	Damar, 1974	4,650	5	6	397		34.0
	Dusun, 1979	2,550	6	7	1,770		42.0
	Gatam, 1977	2,385	1	3			34.0
	Idris, 1982	2,450	1	3	564		39.0
	Kasikan, 1972	660	19	27	936		28.0
	Osam, 1978	900	6	6	306		32.0
	Paitan, 1978	2,315	1	1	251		32.0
	Pedada, 1973	950	30	31	10,854		33.0
	Pusaka, 1977	2,250	20	23	6,532		36.0
	Sabak, 1974	2,350	14	15	2,266		36.0
	Terantam, 1973	900	4	4	136		32.0
	Zamrud, 1975	3,600	53	54	19,803		40.0
	Langgak, 1976	1,380	20	24	1,610		32.0
CALTEX PACIFIC INDONESIA	Central Sumatra, Aman, 1974	4,700	10	10	2,568		39.0
	Ampuh, 1981	6,000	12	12	3,357		38.0
	Antara, 1978	1,425	5	6	933		36.0
	Balam SE, 1972	4,500	13	13	706		29.0
	Balam South, 1969	1,600	52	55	8,700		33.0
	Bangko, 1970	1,950	76	86	31,146		34.0
	Batang CPI, 1975	690	6	7	313		19.0
	Bekasap, 1955	2,950	56	63	19,395		34.0
	Bekasap South, 1968	3,900	9	14	1,165		34.0
	Benar, 1973	2,450	26	30	5,163		33.0
	Cebakan, 1974	4,700	4	5	735		30.0
	Cucut, 1981	5,800	1	1	141		33.0
	Duri, 1941	770	1,237	1,605	86,951		22.0
	Garuk, 1980	4,600		2			31.0
	Hitam, 1975	6,690	4	5	1,064		39.0
	Hiu, 1983	5,900	3	3	879		40.0
	Intan, 1977	3,350	6	7	2,575		33.0
	Jorang, 1972	5,500	17	19	14,825		38.0
	Kerang, 1977	3,900	11	14	1,077		39.0
	Kopar, 1974	5,300	15	19	3,335		37.0
	Kotabatak, 1952	5,500	68	113	20,093		29.0
	Kulin, 1970	2,050	55	68	3,861		20.0
	Libo, 1968	6,000	2	12	8,610	6,513,067,520	35.0
	Libo SE, 1973	5,900	20	27	1,741		42.0
	Lincak, 1981	2,570	4	4	653		35.0
	Menggala N., 1968	3,850	15	20	4,047		33.0
	Menggala S. CPI, 1968	3,765	6	7	1,740		34.0
	Minas, 1944	2,600	465	613	235,007		35.0
	Mindal, 1971	3,400	2	3	67		37.0
	Mutiara, 1976	3,500	2	2			34.0
	Nella, 1977	5,000	3	5	49		35.0
	Obor, 1978	7,370	1	1	102		40.0
	Pager, 1974	4,300	24	26	6,196		38.0
	Pelita, 1977	6,600	5	5	589		39.0
	Pematang, 1959	3,750	37	44	8,272		32.0
	Pematang Bow, 1969	5,300	5	12	1,570		33.0
	Pemburu, 1981	2,300	9	10	2,641		35.0
	Perkebunan, 1977	2,300	1	1			29.0
	Petani, 1964	4,750	31	34	12,288		33.0
	Petapahan, 1971	4,500	23	30	6,342		28.0
	Pinang, 1971	3,950	19	22	3,558		30.0
	Pinggir, 1972	3,300	3	7	270		35.0
	Pinggir South, 1973	3,300	2	4	44		39.0
	Pudu, 1972	5,950	8	13	1,098		35.0
	Pukat, 1983	6,200	2	2	753		40.0
	Puncak, 1979	2,400	14	16	4,069		36.0
	Pungut, 1951	3,400	27	33	5,135		38.0
	Rangau, 1968	6,100	3	11	108		42.0
	Rantaubais, 1972	1,070	14	18	625		18.0
	Rokiri, 1979	6,100		4			41.0
	Seruni, 1972	3,000	22	24	6,194		35.0
	Sikladi, 1975	4,340	19	21	3,133		40.0
	Singa, 1977	3,200	1	1	29		31.0
	Sintong, 1971	3,400	20	21	2,610		32.0
	Sintong SE, 1973	4,500	1	1			36.0
	Suram, 1971	1,750	4	7	261		28.0
	Tandun, 1969	3,000	12	13	1,237		33.0
	Telinga, 1975	4,205	7	10	769		33.0
	Topaz, 1977	5,200	7	8	1,707		33.0
	Topi, 1979	3,630	1	1	26		37.0
	Tunas, 1983	4,819	2	2	177		35.0
	Ubi, 1976	4,350	24	25	1,702		35.0
	Waduk, 1982	6,100	9	11	273		38.0

	Name of field, discovery date	Depth, ft	No. of wells Producing	No. of wells Total	Production 1988 average B/d	Production Cumulative to Dec. 31, 1988 Bbl	°API gravity
ASAMERA (NORTH SUMATRA)	Alu Cison, 1972	3,098	...	24	...	...	50.8
	Geudondong, 1965	3,192	...	23	...	...	53.1
	Iee Tabeu, 1971	2,721	2	47	16	11,897,472	50.3
	Julu Rayeu, 1968	2,832	6	47	120	12,327,979	53.6
	Peudawa, 1980	3,083	...	10	...	...	48.1
	Tualang, 1973	2,631	5	59	1,052	29,985,653	49.9
ASAMERA (SOUTH SUMATRA)	Bentayan, 1932	4,446	7	8	1,186	1,107,443 22.0	
	Kluang, 1913	2,591	15	79	487	33,853,017	42.6
	Mangunjaya, 1934	2,700	3	97	80	23,010,846	32.0
	Panerokan, 1976	4,915	3	8	29	189,540	39.4
	Ramba, 1982	3,150	58	63	24,203	44,790,645	37.0
	Rawa, 1985	4,038	24	30	4,403	1,695,174	38.7
	Tanjung Laban, 1982	3,590	14	27	4,600	6,258,109	38.1
	Tempino, 1931	4,493	4	6	197	1,331,130	40.9
	Keri, 1985	3,957	2	2	103	30,625	41.5
	Supat, 1984	4,626	3	3	54	68,762,336	33.6
	South Rawa, 1985	4,086	1	3	39	19,886	37.0
MAXUS ENERGY	• Cinta, 1970	3,500	40	48	13,068	175,971,048	34.0
	• Duma, 1983	2,300	3	6	110	698,312	24.0
	• Farida, 1982	8,000	14	22	2,872	11,632,953	32.0
	• Gita, 1972	5,000	5	9	702	7,504,813	34.5
	• Karmila, 1983	4,800	7	9	10,695	29,728,296	36.0
	• Kitty, 1973	2,700	7	7	978	13,973,095	18.0
	• Krisna, 1979	4,500	31	41	6,897	59,655,016	37.0
	• Nora, 1973	3,200	4	5	383	8,807,389	29.0
	• Rama, 1974	3,200	44	75	7,046	91,186,520	31.0
	• Selatan, 1971	4,000	9	19	1,080	20,797,606	19.0
	• Sundari, 1982	4,400	13	15	2,955	10,782,195	25.0
	• Titi, 1982	8,000		4		1,654,547	33.0
	Wanda, 1984	4,800	1	5	99	1,585,811	36.0
	• Yvonne, 1980	4,500	9	11	3,561	12,621,026	36.0
	• Zelda, 1971	7,500	26	44	5,144	36,647,449	33.0
PETROMER TREND	Canderawasih, 1976	3,500	18	23	1,635	12,293,954	27.8
	Jaya, 1973	3,050	12	19	1,194	25,802,223	42.0
	Kasim, 1972	3,350	39	53	4,021	47,242,198	38.0
	Walio, 1975	2,750	217	303	14,578	152,075,105	34.2
	Other		9	22	1,202	12,320,843	...
STANVAC (CENTRAL SUMATRA)	Binio, 1972	1,600	20	21	391	11,820,840	34.0
	E. Kayuara, 1983	3,500	44	49	4,964	7,050,207	35.0
	Gemuruh, 1983	2,800	18	19	1,258	2,387,366	24.0
	Kayuara, 1982	3,700	9	10	407	2,027,305	35.0
	Kerumutan, 1980	3,000	23	24	1,122	5,121,079	35.0
	Merbau, 1979	2,700	25	26	1,196	6,770,924	36.0
	Mutiara, 1985	2,700	2	2	49	115,064	34.0
	N. Merbau, 1980	2,600	8	8	233	2,835,300	36.0
	Panduk, 1981	2,500	6	6	346	1,527,653	46.0
	Pekan, 1976	3,700	22	22	631	7,803,638	35.0
	Other	4,600				9,175	...
STANVAC (SOUTH SUMATRA)	Ibul, 1970	5,700	12	14	663	21,909,033	36.0
	Jene, 1985	6,500	18	21	23,792	12,769,493	25.0
	• Kerang (PSC), 1984	2,900	5	7	1,306	748,377	35.0
	Lagan, 1986	2,400	3	4	255	204,955	56.8
	Pian, 1986	6,000	2	3	102	63,735	36.0
	Rambutan, 1972	4,500	4	5	33	3,222,896	42.0
	• Tabuan (PSC)	4,000	8	9	1,002	1,544,061	34.0
	Rimbabat (PSC), 1984	3,200	2	2	75	27,376	34.0
	Other	4,500	6	6	1,210	1,996,843	...
ROY M. HUFFINGTON INC.	Badak, 1972	5,190-10,600	104	127	4,137	39,600,000	21.0
	Mutiara, 1984	900- 5,800	9	32	2,688	3,936,312	30.0
	Nilam, 1974	7,500-11,500	70	95	4,412	20,347,122	32.0
	Pamaguan, 1974	900- 5,100	12	32	1,829	6,622,202	30.0
	Semberah, 1974	2,900-10,100	...	32		7,054	35.0
UNOCAL	• Attaka, 1970	7,500	76	97	51,146	451,865,821	39.0
	• Kerindingan, 1972	7,000		8		5,038,615	23.8
	• Melahin, 1972	7,500	4	6	811	6,513,220	23.1
	• Rajah, 1981	5,500	4	4	2,169	4,388,181	33.8
	• Sepinggan, 1973	11,150	14	18	5,817	43,703,543	34.0
	• Yakin, 1976	5,100	23	28	7,393	20,989,023	18.8
CONOCO GROUP	• Kepiting, 1982	6,000	2	2	2,868	2,261,590	37.0
	• Udang, 1974	5,595	17	17	6,115	56,992,798	40.0
MOBIL OIL	Arun, 1971	10,050	47	60	115,327	335,835,117	55.0
MARATHON	• Kakap KH, 1980	8,500	8	12	10,060	13,026,000	45.0
HUDBAY (MALACCA STRAIT)	• Kurau, 1986	4,500- 9,000	14	17	9,084	3,324,729	47.4
	• Lalang, 1980	3,100- 3,600	11	18	8,626	33,706,719	39.6
	• Melibur, 1984	900- 1,300	12	19	7,604	5,987,814	35.6
	• Mengkapan, 1981	3,850- 4,450	10	10	17,793	14,955,967	42.0
TESORO INDONESIA PETROLEUM	Samboja, 1909	360- 4,380	27	125	423	64,542,145	21.0

		Name of field, discovery date	Depth, ft	No. of wells Producing	No. of wells Total	Production 1988 average b/d	Production Cumulative to Dec. 31, 1988 bbl	°API gravity
		Sanga Sanga, 1897	85- 6,000	110	242	2,710	267,623,502	32.0
		Tarakan, 1906	200- 6,540	135	1,166	1,840	210,824,500	20.0
	TARAKAN PETROLEUM	Tarakan (Mamburungan field), 1984	5,020- 5,131	2	4	...	...	31.1
		Total Indonesia		**6,470**	**11,232**	**1,308,000**	**12,808,790,000**	
IRAN(e)	**NIOC**	Agha Jari, 1936	7,440	58	89			34.0
		Ahwaz Asmari, 1958	8,150	73	85			32.0
		Ahwaz Bangestan, 1958	12,000	...	7			24.3
		Bibi Hakimeh, 1961	4,570	19	33			29.9
		Binak, 1959	10,440	...	4			29.9
		Chillingar, 1974	3,350	...	1			39.3
		Chesmeh Khush, 1967	10,700	...	4			27.7
		Dehluran, 1972	11,900	...	6			31.0
		Gachsaran, 1937	3,400	46	62			31.0
		Haft Kel, 1927	1,980	2	11			37.7
		Karanj, 1963	5,360	7	7			33.9
		Kharg, 1961	10,900	...	...			31.6
		Kupal, 1965	10,500	...	7			32.8
		Lab-e Safid, 1968	4,350	...	7			35.3
		Mansuri, 1963	7,100	4	8			28.4
		Marun, 1963	9,400	55	112			32.6
		Masjid-e Suleiman, 1908	1,600	7	24			39.3
		Naft Safid, 1938	5,000	5	19	2,246,700	36,674,592,200	36.8
		Paris, 1964	4,670	22	27			38.8
		Par-e Siah, 1964	4,250	...	1			37.7
		Pazanan, 1961	7,250	44	71			37.2
		Rag-e Safid, 1964	7,230	19	29			28.6
		Ramin, 1966	12,200	...	...			32.9
		Ramshir, 1962	8,750	...	3			27.6
		Sulabedar, 1971	3,400	...	1			30.4
		Naft-e Shah, 1923	2,000- 3,000	...	...			43.0
		● Bahregansar, 1960	9,000	...	...			30.0
		● Hendijan, 1968	11,000	...	...			23.0
		● Nowruz, 1966	8,200	...	...			21.0
		● Rakhsh, 1969	7,650	...	...			35.8
		● Rostam, 1966	7,000	...	...			34.4
		● Ardeshir, 1969	2,800	...	...			27.0
		● Cyrus, 1962	7,000	...	...			18.3
		● Darius, 1961	11,000	...	...			34.0
		● Fereidoon, 1966	7,000	...	...			28.5
		● Sassan, 1965	7,500- 8,100	...	...			34.0
		Total Iran		**361**	**618**	**2,246,700**	**36,674,592,200**	
IRAQ(e)	**INOC**	Abu Ghurab, 1971	9,800	12	16			24.0
		Ain Zalah, 1939	5,200- 6,500	15	28			31.0
		Bai Hassan, 1953	4,800- 5,400	56	84			34.0
		Balad, 1983	6,000- 7,000	4	8			25.0
		Butmah, 1953	3,900	1	17			31.0
		Buzurgan, 1970	12,000	20	22			24.0
		East Baghad, 1975	6,000- 7,000	32	79			23.0
		Hamrin,* 1973	2,000	...	14			30.0
		Jabal Fauqui, 1974	10,000	20	23			25.5
		Jambur, 1954	5,500-12,500	27	50	2,688,000	20,613,808,000	38.0
		Kirkuk, 1927	2,800- 4,200	71	269			36.0
		Luhais, 1961	8,200	12	21			33.0
		Naft Khaneh, 1909	3,500	7	11			42.5
		Nahr Umar, 1949	8,200	5	13			42.0
		Qaiyanah, 1929	650	33	50			16.0
		Rumaila North, 1958	10,300	303	443			33.0
		Rumaila South, 1953	10,200	133	208			34.0
		Suffayah, 1978	3,900	11	39			25.0
		West Tikrit, 1985	8,200	2	6			23.0
		Zubair, 1949	10,200	56	110			35.0
*Not yet on production		**Total Iraq**		**820**	**1,511**	**2,688,000**	**20,613,808,000**	
ISRAEL	**LAPIDOTH**	Heletz-Brur, 1955	5,200	4	18	77	12,303,798	29.2
		Kochav, 1962	5,500	6	13	261	4,272,183	27.9
	OEIL	Ashdod, 1976	8,400	2	2	34	154,660	32.5
	EMOG	Gurim, 1984	3,280	...	...	...	6,950	17.0
		Total Israel		**12**	**33**	**372**	**16,737,951**	
ITALY	**ELF**	● Rospo Mare, 1975	4,600	9	10	17,769	17,073,773	11.0
		● Santa Maria a Mare, 1974	7,900	8	11	1,196	17,682,616	23.0
		● Sarago Mare, 1979	5,200	5	5	4,857	9,711,987	8.0
	AGIP	Cavone, 1979	10,663-18,068	13	15	2,809	7,620,956	24.0
		Cela Mare, 1959	10,300	12	18	1,859	14,697,599	10.0

				No. of wells		Production		
		Name of field, discovery date	Depth, ft	Producing	Total	1988 average B/d	Cumulative to Dec. 31, 1988 Bbl	°API gravity
		Emilio S., 1971	9,215	...	1	...	337,622	13.0
		Gela, 1956	11,280-11,350	53	68	8,447	102,851,405	10.0
		Malossa, 1973	17,881-21,231	5	8	1,380	25,909,055	55.0
		Narciso, 1985	2,650	...	1	...	337,622	21.1
		Nilde, 1973	4,545	2	3	1,899	19,628,758	38.9
		Perla, 1976	7,850	4	4	592	1,774,235	13.3
		Pisticci-S. Cataldo, 1960	6,820- 6,880	8	12	1,250	7,901,314	11.4
		Ragusa, 1954	5,760	37	37	4,602	127,881,527	19.5
		S. Maria Inbaro, 1985	6,520	3	4	117	312,631	15.9
		Benevento, 1974	6,599	1	1	342	145,640	39.0
		Gaggiano, 1982	13,766	2	2	344	360,717	37.0
		Prezloso, 1982	16,400	3	3	673	245,737	10.0
		V. Fortuna, 1984	19,828	3	4	4,493	1,639,840	46.0
		Other		25	63	2,312	20,793,298	2.8-55.9
	MONTEDISON(e)	Vega		...	...	36,000	13,200,000	...
		Total Italy		**193**	**270**	**90,941**	**390,106,332**	
IVORY COAST	**SIOP**(e)	● Belier, 1975	6,500	11	18	2,000	16,823,000	35.0
	PHILLIPS-AGIP-SEDCO-PETRIOCI	● Espoir,* 1980	6,500-11,000	6	8	10,037	31,076,558	32.3
		Total Ivory Coast		**17**	**26**	**12,037**	**47,899,558**	
JAPAN(e)	**JAPEX**	● Aga-Oki, 1972	7,590	7	7			24.8
		Higashi-Niigata, 1965	4,500- 9,200	18	28			53.9
		Sarukawa, 1958	2,000- 3,200	62	134			32.3
		Yoshii, 1968	8,000	9	25			61.8
		Yurihara, 1976	1,310- 7,610	9	14			43.5
		Katakai, 1960	3,310-16,300	5	16			50.0
		Other		56	77			
	IDEMITSU OIL DEVELOPMENT CO. LTD.	● Agaoki-Kita, 1982	4,950	10	10	12,300	144,124,800	33.0
	TEIKOKU OIL	Yabase, 1933	1,100- 5,800	61	73			33.0
		Minami-Aga, 1964	7,300- 9,600	10	26			38.5
		Minami-Nagaoka, 1984	13,200-15,100	5	11			55.7
		Hagashi-Kashiwazaki, 1970	6,000- 8,900	6	13			62.0
		Kubiki, 1959	1,100- 6,400	94	125			29.7
		Other		35	47			
		Total Japan		**387**	**606**	**12,300**	**144,124,800**	
JORDAN	**NRA**	Hamzah, 1984	9,500	3	17	500	427,000	30.0
		Total Jordan		**3**	**17**	**500**	**427,000**	
KUWAIT(e)	**KOC**	Burgan, 1938	4,800	210	393			30.8
		Ahmadi, 1952	4,800	11	84			31.7
		Magwa, 1951	4,800	71	113			33.0
		Raudhatain, 1955	8,600	41	53			34.4
		Bahra, 1956	8,500		2	1,335,000	23,138,608,000	
		Sabriya, 1957	8,300	9	44			36.3
		Minagish, 1959	10,000	1	21			34.4
		Umm Gudair, 1962	9,000	20	33			26.9
		Total Kuwait		**363**	**743**	**1,335,000**	**23,138,608,000**	
LIBYA	**AGIP**	Bu Attifel, 1968	14,300	30	39	157,266	828,249,617	41.0
		Rimal Katib, 1965	14,000	5	7	3,554	6,553,690	35.0
		Bouri	8,700	10	10	4,595	1,677,175	26.0
	ELF	El Meheiriga	10,900	1	2	857	28,923,000	46.0
	LNOC(e)	Arshad, 1966	10,100					42.0
		Jebel, 1962	8,100					38.0
		Majid, 1968	9,000- 9,800					
		Don Mansour Unit	5,600					
		Nasser, 1959	5,900- 7,600					38.0
		Lehib-Dor Marada Unit, 1965	9,500					50.0
		Raguba, 1961	5,400					43.0
		Beda, 1959	4,000					36.0
		Bualawn, 1972	6,000					40.0
		Dor, 1967	6,400					33.2
		Kotla, 1963	5,500					34.0
		Sanabi B & D, 1961	9,000-10,000					39.0
		Sarir, 1961	9,000					37.2
		Amal, 1959	9,900					37.5
		Ora, 1962	7,250					40.2
		Ghani, 1978	8,000					40.0
		Bani, 1968	3,500- 3,750					43.4
		Belhedan, 1962	7,000					33.6
		Dahra, 1959	3,100- 3,700					37.0-41.0
		Defa, 1969	5,400- 5,900					35.6

*Shut down Oct. 26, 1988.

				No. of wells		Production		
		Name of field, discovery date	Depth, ft	Producing	Total	1988 average B/d	Cumulative to Dec. 31, 1988 Bbl	°API gravity
		Gialo, 1961	2,200- 6,300					35.7
		Harsh, 1978	7,400	491	491	858,728	15,644,076,770	34.6
		Khalifa, 1978	5,400- 7,000					34.6
		Masrab, 1978	10,000					39.6
		Samah, 1961	9,000					33.4
		Waha, 1960	6,000					36.0
		Zaggut, 1962	6,000					36.4
		Balat, 1983	5,100- 5,400					32.2
		Ali, 1975	3,900	1	2			50.0
		Almas, 1975	4,000	5	8			49.5
		Intisar A, 1967	9,750	8	19			45.0
		Intisar B, 1974	9,600	2	2			50.0
		Intisar C, 1967	9,650	1	6			37.5
		Intisar D, 1967	9,400	19	27			39.0
		Intisar E, 1968	5,300- 7,100	8	11			34.7
		Nafoora-Augila, 1966	2,200-10,000	13	55			35.5
		Aswad, 1978	6,250	8	8			46.0
		Sabah, 1977	5,500	36	38			42.0
		Zella, 1977	6,750	27	31			48.1
		Other	7,900- 8,900	1	2			40.4
		Fidaa, 1979	7,000	9	9			41.7
		Hakim, 1978	6,700	3	3			48.5
		Total Libya		**678**	**770**	**1,025,000**	**16,509,480,252**	
MALAYSIA	**ESSO MALAYSIA(e)**	● Bekok, 1976	5,500	23	30			47.0
		● Pulai, 1973	4,300	23	32			42.3
		● Tapis, 1975	6,700	70	106			45.0
		● Kepong, 1979	6,000	3	10			47.0
		● Tiong, 1978	5,800	28	42			47.0
		● Tinggi, 1980	4,400	26	31	304,000	706,000,000	48.0
		● Irong Barat, 1979	3,300	10	12			35.0
		● Semangkok, 1980	3,700	5	5			42.5
		● Guntong, 1978		9	14			
		● Palas, 1979		11	11			
		● Tabu, 1978		9	13			
		● Seligi, 1988						
	SARAWAK SHELL BERHAD	● D-18, 1981	4,000	5	5	3,550	2,899,000	39.9
		● Temana, 1972	3,100	19	29	9,560	40,199,000	35.0
		● Bayan, 1976	4,200	7	9	13,110	26,498,000	37.3
		● Other	5,600-11,000	29	33	10,930	268,726,000	
	SABAH SHELL	● Barton, 1971	2,400	4	4	3,010	10,402,000	37.0
		● South Furious, 1974	3,300	7	15	3,010	13,499,000	30.0
		● St. Joseph, 1975	2,200	11	14	16,360	20,271,000	32.0
		● Erb West, 1977	6,785	15	19	6,630	21,620,000	30.0
		● Samarang, 1972	5,700	56	80	59,840	257,301,000	37.0
		● Ketam, 1977	4,800	1	4	270	999,000	30.0
	PETRONAS CARIGALI(e)	● Tembungo, 1971	6,000	8	16			40.0
		● Fairley Baram, 1973	8,655		2			39.5
	SARAWAK SHELL/PETRONAS CAG.(e)	● Baronia, 1967	7,900	19	40			42.0
		● Betty, 1967	7,900	13	17	108,410	415,152,000	38.0
		● Tukau, 1966	5,000	26	48			29.2
		● Bokor, 1972	2,000	18	19			35.0
		● Siwa, 1973	4,100	4	4			25.0
		Total Malaysia		**467**	**670**	**540,000**	**1,792,374,060**	
MEXICO(e)	**NORTH ZONE, NE**	Misión, 1945	5,440	3	3			
		Monterrey, 1950	6,510	5	6			
		Tigrillo, 1971	3,342		11			
	NORTH ZONE, N.	● Arenque, 1970	11,362	17	17			26.0
		Constituciones, 1956	6,350	176	176			17.0
		Ebano-Pánuco, 1901	1,450	324	324			12.0
		Tamaulipas	4,200	152	152			19.0
	NORTH ZONE, S.	Chicontepec, 1973	4,264	220	220			34.1
		● Isla de Lobos, 1963	6,875	9	9			40.0
		● Marsopa, 1974	10,198	7	7			39.0
		Naranjos-C. Azul, 1909	1,800	206	206			22.0
		Tres Hermanos, 1959	6,960	34	34			21.0
		Other						
	CENTRAL ZONE, POZA RICA	● Atun, 1966	9,040	7	7			37.0
		● Bagre, 1973	10,919	8	8			33.0
		Escolin, 1942	7,216	95	95			26.3
		Hallazgo, 1955	10,170	36	36			25.0
		Jiliapa, 1958	7,390	29	29			24.0
		Mecatepec, 1941	7,544	32	32			29.8
		Miquetla, 1959	6,480	57	57			35.0
		Poza Rica, 1930	7,090	132	132			35.0
		Pres. Aleman, 1949	8,036	86	86			26.0

			No. of wells		Production		
	Name of field, discovery date	Depth ft	Producing	Total	1988 average B/d	Cumulative to Dec. 31, 1988 Bbl	°API gravity
	Remolino, 1962	10,74[illegible]	36	36			29.5
	San Andres, 1956	10,410	123	123			29.0
	Other	—	315	316			...
CENTRAL ZONE, CUENCA DEL PAPALOAPAN	Matapionche, 1974	11,129	29	45			35.6
	Other	—	22	31			—
SOUTHERN ZONE, NANCHITAL	Ixhuatlán Ote., 1965	1,960	20	34			22.6
	Moloacan, 1962	500	170	207			22.3
	Santa Rosa, 1952	1,312	6	9			25.4
CENTRAL ZONE, N. FAJA DE ORO	Acuatempa, 1955	4,085	6	6			21.0
	Muro, 1965	3,966	11	19			17.0
	Ordonez, 1952	5,220	8	8			21.0
	Ocotepec, 1953	3,737	13	13			20.0
	Santa Agueda, 1953	4,780	3	3			16.0
	Other	—	57	57			—
SOUTHERN ZONE, EL PLAN	Agata, 1956	3,830	9	15			
	Bacal, 1976	3,500	24	40			35.0
	Concepción, 1974	1,600	3	15			31.0
	Cuichapa, 1935	2,200	63	123			30.0
	El Plan, 1931	1,700	67	86			30.0
	Lacamango, 1973	1,700	18	27			26.3
	Los Soldados, 1953	4,492	18	22			32.0
	Other	—	26	38			—
SOUTHERN ZONE, AGUA DULCE	Blasillo, 1967	7,216	31	58	2,606,000	15,630,240,000	40.0
	Cinco Presidentes, 1960	6,862	73	134			35.0
	Burro, 1931	2,200	23	38			26.0
	Venta, 1954	4,730	20	83			41.0
	Ogarrio, 1957	5,790	57	194			38.0
	Otates, 1965	7,469	12	18			39.0
	Rodador, 1971	11,398	14	14			26.0
	Sanchez Magallanes, 1957	4,240	73	345			27.0
	San Ramon, 1967	9,517	29	65			30.0
	Tonala, 1928	1,770	31	61			28.0
	Other		3	15			
SOUTHERN ZONE, COMALCALCO	Agave, 1977	13,450	7	16			41.7
	Arroyo Zanapa, 1978	14,599	1	2			38.9
	Arteza, 1977	11,800	3	5			26.4
	Ayapa, 1972	8,200	3	5			7.2
	Cacho Lopez, 1977	14,250	1	1			29.0
	Cactus, 1972	14,100	14	30			31.5
	Carrizo, 1962	3,500	18	35			23.3
	Castarrical, 1967	10,080	38	59			29.3
	Comoapa, 1979	14,432	4	6			44.5
	Copano, 1977	11,890	9	10			43.9
	Cunduacán, 1974	13,775	12	42			28.9
	El Golpe, 1963	3,500	93	135			25.7
	Giraldas, 1977	15,225	21	22			37.0
	Iride, 1974	13,775	12	16			28.5
	Muspac, 1982	9,676	1	13			57.0
	Mecoacan, 1957	2,200	17	30			8.6
	Mora, 1981	—	61	63			38.1
	Mundo Nuevo, 1977	11,800	4	5			46.0
	Nispero, 1974	14,100	4	18			34.4
	Paredon, 1978	15,690	12	13			39.8
	Oxiacaque	11,150	5	21			29.1
	Platanal, 1978	15,900					30.2
	Rio Nuevo, 1975	14,950	5	5			34.8
	Samaria (Cret), 1973	14,209	26	49			31.0
	Santuario, 1966	9,617	28	37			37.0
	Sitio Grande, 1972	13,766	19	22			35.0
	Sunuapa, 1978	12,887	2	7			32.8
	Tapijualpa, 1982	15,613	1	12			39.8
	Tintal, 1968	5,904	4	6			22.0
	Topen, 1978	11,172	2	3			25.4
	Tupilco, 1959	9,685	67	101			27.0
	Bellota, 1982	17,056	9	12			41.0
	Cardenas, 1979	17,548	26	45			38.0
	Chiapas, 1979	12,136	5	7			42.0
	Fenix, 1979	17,876	4	7			40.0
	Iris, 1979	14,432	8	8			39.2
	Jujo, 1980	17,548	18	19			32.0
	Caparroso, 1982	18,368	1	1			41.2
	Tecominoacan, 1983	19,519	1	5			37.5
	Jolote, 1983	18,119	1	1			39.4
	Artesa Terc., 1984		2	3			28.0
	Carmito, 1980	10,050	1	1			45.6
	Eden, 1983	17,590	1	2			38.5
	Samaria Terc., 1965	4,920	16	23			13.9
	Other		16	37			
GULF OF CAMPECHE	● Cantarell, 1976	8,528	63	75			21.3
	● Abkatun, 1978	11,800	25	35			30.0

		Name of field, discovery date	Depth, ft	No. of wells Producing	No. of wells Total	Production 1988 average B/d	Production Cumulative to Dec. 31, 1988 Bbl	°API gravity
		● Ku, 1979	10,000	8	15			22.0
		● Pol, 1979	12,600	8	8			35.0
		● Chuc, 1982	13,100	1	3			35.0
		● Ixtoc, 1984	—	1	2			35.0
		Total México		**3,768**	**5,120**	**2,806,000**	**15,630,240,000**	
MOROCCO(e)		Essaouira	—	4	4	300	16,266,800	
		Rharb, 1951	4,590	1	1			
		Total Morocco		**5**	**5**	**300**	**16,266,800**	
NETHERLANDS	UNOCAL	● Helder, 1980	4,800	11	13	7,453	19,528,211	21.6
		● Helm, 1979	4,400	7	8	1,723	7,627,815	17.9
		● Hoorn, 1981	5,000	7	7	5,183	19,277,390	25.8
	NAM	DeLier, 1955	5,200	22	33	560	16,905,000	33.2
		Rotterdam, 1984	—	2	2	2,720	2,296,000	30.5
		Pernis-West, 1987	—	—	—	100	37,000	28.2
		Berkel, 1954	—	17	17	3,090	5,831,000	32.0
		Ysselm, 1956	5,200	59	86	5,240	90,718,000	26.8
		Pynacker, 1955	—	4	5	630	6,231,000	36.3
		Wassenaar, 1956	4,200	28	41	1,380	47,005,000	18.7
		Zoetermeer, 1957	3,200	30	30	770	10,082,000	16.5
		Werkendam, 1958	—			20	207,000	33.0
		Schoonebeek, 1944	2,500	76	495	9,210	235,371,000	12.3
	CONOCO	● Kotter, 1980	6,500	8	10	17,985	31,474,549	33.0
		● Logger, 1982	6,500	6	8	9,984	12,393,941	33.5
	AMOCO	● Rijn, 1982	6,600	12	25	9,950	14,614,903	35.0
		Total Netherlands		**289**	**780**	**75,998**	**519,599,809**	
NEUTRAL ZONE	AOC	● Hout, 1969	5,300-10,500	23	34	23,906	280,129,303	33.0
		● Khafji, 1961	4,400-10,300	135	165	163,504	2,441,476,353	28.2
	TEXACO & KOC(e)	S. Fuwaris, 1963	6,300	5	9	2,000	22,000,000	25.0
		S. Umm Gudair, 1966	8,900	16	17	36,000	336,000,000	24.3
		Wafra, 1953	1,100- 7,000	322	427	98,000	1,378,000,000	18.9-23.5
		Total Neutral Zone		**501**	**652**	**323,410**	**4,457,605,656**	
NEW ZEALAND	SHELL-BP-TODD	● Kapuni, 1959	11,700	11	14	5,935	41,170,000	54.0
		● Maui, 1969	11,000	14	14	6,795	28,740,000	51.0
	PCNZ	Anuroa, 1987	—	1	1	*852	9,800	46.1
		Kaimiro, 1982	11,900	1	1	*74	118,000	42.0
		McKee, 1980	7,848- 8,251	19	19	9,984	13,745,000	38.5
		Tariki, 1986	—	1	1	*1,474	14,000	52.7
		Waihapa, 1988	—	2	2	*2,943	1,077,000	36.6
		Total New Zealand		**49**	**52**	**28,057**	**84,873,800**	
NIGERIA	AGIP	Agwe, 1975	10,800	1	1	110	2,042,504	50.1
		Akri, 1967	9,600-10,600	3	11	1,862	60,056,817	40.1
		Akri West, 1972	9,900-10,200	—	2		482,258	31.4
		Ashaka, 1968	9,700-12,000	1	1	1,145	2,762,447	38.4
		● Beniboye N., 1978	9,000-10,000	9	9	8,904	11,572,397	29.6
		Beniku, 1974	12,000	—	2	—	3,309,326	29.5
		Clough Creek, 1977	10,000-12,400	7	9	7,439	22,460,507	29.3
		Ebegoro, 1976	11,500-12,000	7	9	7,509	62,109,913	35.7
		Ebocha, 1965	8,000-10,900	8	16	6,959	110,337,245	35.5
		Idu, 1973	7,750-10,700	—	10		13,862,581	28.0
		Kwale, 1967	10,000-11,500	8	10	7,667	7,500,675	36.4
		M'Bede, 1966	7,300- 9,400	10	20	14,132	163,238,542	40.9
		Obama, 1973	11,600-14,300	6	8	14,577	97,780,167	37.2
		Obiafu, 1967	9,300-12,200	18	20	15,815	85,766,070	42.4
		Obrikom, 1973	8,000-10,000	6	13	3,371	55,040,901	45.1
		Odugri, 1972	12,500	2	2	634	9,788,065	47.2
		Ogbogene, 1972	10,000	—	2	—	3,302,763	37.0
		Ogbogene W., 1982	13,000	—	1	—	353,136	56.2
		Okpai, 1968	10,000-12,000	8	8	4,779	19,031,162	44.6
		Omoku W., 1975	11,500	—	1	—	4,746,492	27.4
		Oshi, 1972	9,600-11,300	10	11	9,890	66,552,033	34.1
		Tebidaba, 1975	10,300-13,300	7	10	17,017	118,463,094	33.0
		Umuoru, 1975	14,100	3	4	2,477	5,353,184	40.0
	ASHLAND	Adanga, 1980	10,611-17,586	9	9	12,953	15,386,228	35.0
		● Akam, 1980	6,700	10	10	7,561	5,802,362	35.2
		● Izombe-Ossu, 1974	9,500	8	8	13,262	10,645,430	35.0
		Ebughu, 1983	7,250	3	3	457	167,263	21.0
	ELF	Aghigo, 1972	—	*17	29	4,466	24,405,554	24.8
		Erema, 1972		4	5	4,715	10,847,810	24.6
		Obagi, 1964	—	61	68	48,743	368,074,953	24.6

*Production rates only. No permanent production facilities in place.

	Name of field, discovery date	Depth, ft	No. of wells		Production		°API gravity
			Producing	Total	1988 average B/d	Cumulative to Dec. 31, 1988 Bbl	
	Obodo-Jatumi, 1966	...	16	18	16,116	69,115,408	24.8
	Okpoko, 1967	...	16	17	7,304	32,326,957	24.8
	Upamini, 1965	...	14	14	3,600	16,898,167	24.8
GULF NIGERIA	Abiteye, 1970	5,750- 9,400	10	19	5,294	64,007,793	39.7
	● Delta, 1965	5,600- 9,500	20	27	18,566	169,822,039	37.3
	● Delta South, 1965	7,100-10,179	18	28	31,483	269,735,952	38.4
	● Isan, 1970	5,900- 9,000	6	11	2,369	42,897,085	40.4
	Jisike, 1975	6,300- 7,600	1	4	1,589	6,338,968	41.1
	Makaraba	7,100-12,005	20	25	20,819	92,637,107	27.7
	● Malu, 1969	4,800- 6,300	12	19	16,371	102,394,051	40.4
	● Mefa, 1965	8,570-12,030	5	5	5,832	67,968,348	38.1
	● Meji, 1965	5,200-10,900	19	22	18,979	151,312,520	31.9
	● Meren, 1965	5,000- 7,500	31	55	57,685	493,040,316	31.9
	● Okan, 1964	5,500- 9,245	35	71	33,485	390,246,940	38.1
	● Parabe/Eko, 1968	4,500- 8,200	13	26	10,783	103,215,846	40.4
	Robertkiri, 1964	11,484-13,190	10	12	10,403	12,516,783	40.2
	● Tapa, 1978	8,150-10,842	8	10	9,233	28,142,426	39.5
	Utonana, 1971	7,400- 9,165	1	5	816	8,165,121	20.4
	● W. Isan, 1971	7,825-10,229	5	9	2,011	34,745,318	40.4
	Yorla South, 1974	11,389-12,635		2		834,040	41.0
MOBIL	● Adua, 1967	6,970	5	5	10,7680	46,537,232	30.3
	● Asabo, 1966	5,600	9	14	15,175	161,113,170	32.4
	● Asabo D		1	2	1,241	2,250,081	35.0
	● Ata					433	
	● Ekpe, 1966	8,200	8	17	9,613	188,394,905	30.3
	● Ekpe-WW, 1977	6,810	5	6	7,449	190,332,525	30.3
	● Eku, 1966	5,420	3	7	3,178	15,955,736	30.8
	● Enang, 1968	6,600	18	23	23,127	35,960,995	35.1
	● Etim, 1968	6,200	7	9	16,989	112,511,703	32.9
	● Idoho, 1966	9,020	3	4	1,017	28,842,611	30.8
	● Inim, 1966	5,850	7	10	14,963	145,437,397	37.8
	● Isobo, 1968	7,345	3	5	3,263	8,180,634	30.8
	● Iyak SE		6	5	16,155	40,682,165	38.7
	● Mfem, 1967	5,200	2	4	4,185	25,627,206	36.1
	● Oso						
	● Ubit, 1968	5,400	30	45	25,322	185,674,618	36.1
	● Unam, 1968	5,180	7	8	9,744	43,881,190	33.5
	● Usari					5,885	
	● Utue, 1966	5,700	5	7	8,653	70,170,645	36.8
	Edop		3	4	21,558	8,394,906	37.7
PAN OCEAN (NIGERIA)	Ogharefe, 1973	9,900	7	7	2,764	9,890,444	47.4
SHELL(e)	Ugh-Ogini, 1964	5,860	7	17			19.0
	Ugh-Uzere-East, 1960	8,500	2	4			23.0
	Ugh-Uzere-West, 1964	8,500	11	11			23.0
	Ugh-Olomoro, 1963	7,000-10,000	26	32			22.0
	Ugh-Oweh, 1964	12,300	11	11			28.0
	Ugh-Kokori, 1960	8,000- 9,800	23	27			42.0
	Ugh-Afiesere, 1966	8,000- 9,000	30	33			22.0
	Ugh-Eriemu, 1961	12,500	13	16			26.0
	Ugh-Ughelli-East, 1959	11,800	10	11			35.0
	Ugh-Ughelli-West, 1963	7,400-10,200	8	10			21.0
	Ugh-Utorogu, 1964	9,000	14	19			25.0
	Ugh-Oroni, 1964	12,000		7			22.0
	Ug -Warri-River, 1961	12,264	2	3			31.0
	Ugh-Evwreni, 1968	10,900	10	11			38.0
	Ugh-Isoko, 1960		1	2			19.0
	Forc-Odidi, 1967	10,980	27	30			37.0
	Forc-Opukushi, 1963	7,823	12	17			29.0
	Forc-Jones Creek, 1967	7,000- 9,000	31	34			29.0
	Forc-Opuama, 1973		3	5			41.0
	Forc-Egwa, 1967	9,350	20	24			37.0
	Forc-Forcados/Yokri, 1968	10,859	61	92			22.0
	Forc-Batan, 1968	11,000	8	9			27.0
	Forc-Escravos Beach, 1969	8,176	9	13	648,055	7,212,969,199	36.0
	Forc-Otumara, 1969	8,176	26	29			25.0
	Forc-Saghara, 1970	8,590	5	6			31.0
	Forc-Ajuju, 1970	13,324	1	2			27.0
	Forc-Benisede, 1973		15	19			23.0
	Node-Sapele, 1970	12,788	13	19			42.0
	Node-Oben, 1972	12,036	14	23			40.0
	Forc-Opukushi N., 1977		1	2			30.0
	Abura		1	3			44.8
	Rapele		1	3			44.4
	Amukpe		1	2			38.9
	Osioka		2	2			
	Phl-Bomu, 1958	6,500- 7,500	12	40			36.0
	Phl-Imo River, 1959	5,800-10,000	38	47			32.0
	Phl-Nkali, 1963	12,000	4	10			42.0
	Phl-Elelenwa, 1959	11,000	6	11			39.0
	Phl-Umuechem, 1969	5,800-10,700	8	19			36.0
	Phl-Apara, 1960	9,000	4	8			36.0

				No. of wells		Production		
		Name of field, discovery date	Depth, ft	Producing	Total	1988 average B/d	Cumulative to Dec. 31, 1988 Bbl	°API gravity
		Phl-Bodo-West, 1959	9,700	9	11			29.0
		Phl-Afam, 1956	6,000	6	15			45.0
		Phl-Yorla, 1970	11,917	8	13			44.0
		Phs-Bonny, 1959	12,254	9	15			36.0
		Phs-Cawthorne Channel, 1963	11,000	21	30			38.0
		Phs-Ekulama, 1958	10,483	23	29			32.0
		Phs-Soku, 1958	11,500	18	23			31.0
		Phs-Orubiri, 1971	...	2	6			38.0
		Egb-Oguta, 1965	10,300	6	22			46.0
		Eade-Utapate South, 1974	...	7	11			44.0
		Eade-Opobo South, 1974		4	5			44.0
		Ibigwe		1	2			...
		Korokoro	...	6	8			34.3
		Otamini	...	3	5			21.8
		Ugada		1	1			...
		Ahia	...	9	13			38.2
		Akpor		...	3			27.5
		Alakiri		12	21			38.2
		Assa		2	2			20.7
		Egbema West		7	17			42.2
		Ebubu		2	8			22.2
		Egbema		6	7			35.5
		Cesw-Nun River, 1960	...	4	6			39.0
		Cesw-Etelebou, 1971	12,000	9	9			33.0
		Cesw-Kolo Creek, 1960	12,000	15	25			42.0
		Cesw-Diebu Creek, 1966	...	9	12			43.0
		Phl-Isimiri, 1964	5,900-11,000	4	6			28.8
		Phl-Onne, 1965	10,384	3	3			29.0
		Phl-Obigbo-North, 1963	6,500-10,000	25	38			22.0
		Phl-Ajokpori, 1967	...	2	2			29.0
		Phl-Agbada, 1960	8,000-12,000	35	46			32.1
		Phl-Akuba, 1967	...	1	1			29.0
		Cesw-Adibawa, 1967	11,950	12	23			26.0
		Cesw-Adibawa NE, 1973	...	3	3			26.0
		Cesw-Ubie, 1961	14,380	5	6			28.0
		Phl-Obeakpu, 1975	...	2	4			45.0
		Cosw-Nembe Creek, 1973	...	36	38			35.0
		Phs-Akaso, 1979	...	1	1			30.0
		Bugama Creek	...	5	7			43.0
		Kalaekule	...	7	7			39.6
		Krakama	...	6	10			23.8
		Odeama Creek	...	5	5			33.3
		Tai	...	2	2			37.4
		Obele	...	...	5			...
		Rumuekpe	...	2	3			...
		Enwhe	...	...	2			...
		Akaso	...	...	1			...
	TEXACO-CHEVRON-NNPC	● Funiwa, 1978	5,000- 7,000	20	22	22,177	43,904,868	38.2
		● Middleton, 1972	5,000- 7,000	3	7	2,363	15,813,022	36.6
		● North Apoi, 1973	4,000- 8,100	22	26	33,776	162,994,363	35.8
		● Pennington, 1965	5,000-10,400	1	10	2,000	35,109,345	38.2
		● Sengana, 1967	11,400-12,500	...	2	...	666,120	46.7
		Total Nigeria		**1,513**	**2,187**	**1,390,000**	**12,96,728,331**	
NORWAY	**AMOCO**	● Valhall, 1972	8,200	22	22	63,420	103,047,300	35.0
	BP	● Ula, 1976	11,000	6	10	95,485	66,591,513	39.0
	CONOCO	● Murchison, 1975	9,900	4	6	13,120	57,716,337	38.0
	NORSK HYDRO	● Oseberg, 1979	7,500	7	9	19,350	13,992,000	34.0
	PHILLIPS	● Albuskjell, 1972	10,400	13	19	3,020	41,394,674	45.0
		● Cod, 1968	9,500	6	7	1,723	15,349,507	55.0
		● Edda, 1972	10,480-10,600	7	7	1,449	23,390,121	41.5
		● Ekofisk, 1968	10,000	40	42	110,443	950,745,047	41.1
		● Eldfisk, 1970	9,350-10,000	35	39	73,509	250,145,737	37.6
		● Tor, 1970	10,000	10	13	9,820	118,125,361	38.0
		● West Ekofisk, 1970	10,300	10	13	4,895	70,253,270	43.9
	STATOIL	● Gullfaks, 1978	9,500- 9,700	15	21	148,522	79,900,000	29.3
		● Statfjord, 1974	9,500	48	77	596,343	1,241,437,569	39.0
		Total Norway		**223**	**285**	**1,141,099**	**3,032,088,436**	
OMAN	**PDO**	Al Burj, 1987	6,890	3	4	1,000	315,000	26.0
		Al Ghubar, 1974	1,916	4	6	3,000	5,031,000	21.0
		Al Huwaisah, 1969	5,320	38	39	15,000	171,061,000	37.0
		Amal/Amal South, 1973	4,638	32	35	12,000	11,950,000	24.0
		Anzauz, 1984	7,098	3	3	4,000	6,918,000	46.0
		Bahja, 1984	5,697	6	11	11,000	8,176,000	49.0
		Barik, 1974	8,856	3	3	3,000	2,516,000	48.0
		Birba, 1978	8,528	...	...	2,000	582,000	30.0
		Burhaan,-1984	4,011	1	3	1,000	1,635,000	37.0

				No. of wells		Production		
		Name of field, discovery date	Depth, ft	Producing	Total	1988 average B/d	Cumulative to Dec. 31, 1988 Bbl	°API gravity
		Dhiab, 1985	5,414	6	6	1,000	629,000	26.5
		Fahud, 1964	2,499	155	232	63,000	774,176,000	32.5
		Fayyadh, 1983	3,608	1	1	535	503,000	27.0
		Ghaba North, 1972	2,227	14	25	8,000	52,828,000	34.5
		Habur, 1975	5,800	1	2	205	4,390,000	14.8
		Hasirah, 1984	8,708	9	12	5,000	3,773,000	50.0
		Ishan, 1984	5,578	3	4	1,500	672,000	27.5
		Jalmud, 1979	4,236	3	3	310	377,000	22.5
		Jalmud North, 1980	4,265	2	2	310	252,000	22.5
		Jameel, 1984	5,906	3	4	1,000	482,000	30.2
		Jawdah, 1984	3,570	3	3	2,000	1,700,000	22.0
		Karim West, 1982	3,546	20	20	11,000	13,836,000	23.0
		Kaukab, 1983	8,282	...	1	900	1,258,000	32.0
		Lekhwair, 1968	4,352	46	63	23,000	65,406,000	38.6
		Mahjour, 1979	11,700	1	3	1,000	2,264,000	37.2
		Marmul, 1977	5,087	167	181	39,000	124,522,000	22.3
		Mawhoob, 1985	6,562	1	1	92	82,000	25.7
		Mukhaizna, 1975	3,478	...	...	...	12,400	15.0
		Natih, 1963	4,788	29	67	27,000	351,568,000	31.0
		Nimr, 1980	3,296	93	96	34,000	24,527,000	21.3
		Qaharir, 1978	4,536	24	29	7,000	23,737,000	30.4
		Qaharir East, 1978	4,936	2	4	184	734,000	30.4
		Qarn Alam, 1972	1,354	4	7	1,000	19,370,000	15.0
		Qata, 1979	4,707	9	14	2,000	4,402,000	26.2
		Rahab, 1977	3,237	19	25	3,000	6,478,000	25.0
		Ramlat Rawl, 1987	2,720	1	1	395	144,000	39.7
		Rasha, 1982	4,310	4	5	1,000	1,258,000	32.8
		Rima, 1979	3,247	43	44	64,000	128,925,000	32.8
		Runib, 1978	3,215	7	7	2,000	1,887,000	20.3
		Saih Nihaydah, 1972	8,700	19	25	3,000	157,854,000	39.4
		Saih Rawl, 1973	9,826	14	24	10,000	91,191,000	39.7
		Sayyala, 1981	3,690	11	11	29,000	29,558,000	47.9
		Shibkah, 1976	2,591	1	2	164	821,300	31.0
		Simsim, 1985	5,250	9	10	5,000	2,893,000	28.1
		Suwaihat, 1982	6,452	8	12	9,000	11,320,000	44.1
		Thuleilat, 1986	3,773	11	11	5,000	1,887,000	23.0
		Wafra, 1983	5,510	3	7	2,000	1,887,000	36.5
		Warad, 1985	4,922	3	3	1,000	629,000	28.4
		Yibal, 1962	8,465	174	185	164,000	666,634,000	39.6
		Zahra, 1986	6,562	2	2	1,000	431,000	32.1
		Zareef, 1985	3,264	7	8	8,000	6,289,000	47.0
		Zauliyah, 1981	8,177	9	14	6,000	12,578,000	47.0
	ELF GROUP	Ramlat	...	1	1	72	122,105	...
		Sahmah, 1978	12,400	7	7	5,000	24,539,481	45.1
	OCCIDENTAL	Safah, 1983	6,500	54	54	15,400	8,840,000	42.0
		Total Oman		**1,093**	**1,342**	**615,067**	**2,835,850,286**	
PAKISTAN	**PAKISTAN OILFIELD LTD.**	Balkassar, 1946	9,398	2	4	432	31,530,084	26.0
		Dhulian, 1936	8,899	14	41	24	41,314,779	48.0
		Meyal, 1968	12,513	8	10	3,436	29,596,654	41.3
		Joya Mair, 1944	6,900	2	3	225	5,763,597	15.0
		Khaur, 1915	9,306	1	3	8	4,167,399	33.0
	PAKISTAN PETROLEUM LTD.	Adhi, 1978	9,118- 9,190		4.	...	1,416,737	48.5
	OGDC	Chak-Naurang, 1986	9,187	2	4	731	54,808	14.3
		Fimkassar, 1982	11,465	1	1	7	31,809	39.0
		Ghotana, 1986	7,874	2	2	129	116,202	42.1
		Tando Alam, 1984	7,546- 8,205	9	14	2,575	4,586,054	41.4
		Thora, 1987	7,546	2	3	2,268	286,311	...
		Toot, 1968	15,125	14	15	1,300	9,428,741	38.0
		Sono, 1988	7,618	2	4	1,103	403,674	...
		Lashari Centre, 1988	7,218	1	2	105	38,402	...
	UNION TEXAS	Dabhi, 1984	5,975	1	4	1,170	1,791,000	39.0
		Khaskeli, 1981	3,600	4	9	760	7,068,000	39.0
		Laghari, 1983	2,500	5	7	5,250	12,096,000	42.0
		Mazari, 1985	3,520	5	5	6,900	4,560,000	43.0
		South Mazari, 1985	3,980	2	3	930	341,000	38.0
		Other	...	...	26	...	...	31.0-46.0
	OCCIDENTAL	Dhurnal, 1984	13,100	3	6	18,052	22,307,974	38.0
		Total Pakistan		**80**	**170**	**45,405**	**176,899,225**	
PERU	**PETROMAR S.A.**	• Litoral, 1955	1,500- 6,000	100	140	2,571	37,350,888	36.0-40.0
		• Lobitos, 1960	3,500- 7,500	144	269	6,422	52,356,399	38.0
		Pena Negra, 1960	3,000- 8,500	147	303	13,047	108,954,305	38.0
		• Providencia, 1967	3,000- 7,000	41	84	1,151	21,255,989	38.0-40.0
		Other		3	10	160	255,979	...
	OCCIDENTAL	• Bartra, 1979	8,000- 8,930	7	16	3,052	18,163,316	11.5
		• Capahuari Sur, 1973	11,800-12,900	17	27	8,992	131,990,083	35.6

				No. of wells		Production		
		Name of field, discovery date	Depth, ft	Producing	Total	1988 average B/d	Cumulative to Dec. 31, 1988 Bbl	°API gravity
		● Dorissa, 1978	9,800-10,600	7	12	7,060	37,168,169	34.0
		● Forestal, 1973	9,000- 9,900	9	11	6,129	34,897,938	26.7
		● Huayuri Sur, 1977	10,000-10,800	7	12	3,190	18,570,907	29.3
		● Jibarito, 1981	9,000- 9,650	5	5	4,948	11,457,819	10.8
		● Jibaro, 1974	10,110-10,155	5	6	3,095	7,468,290	11.3
		● San Jacinto, 1978	7,200- 9,760	10	12	5,601	28,952,534	13.1-23.5
		● Shiviyacu, 1973	9,100-10,100	17	24	17,805	65,060,157	20.8
		Other	...		12	798	2,051,797	...
	OCCIDENTAL/BRIDAS	Talara area	1,343- 6,080	709	1,292	5,197	46,525,000	34.0
	PETROPERU	Capirona, 1978	9,800-12,000	3	5	726	3,540,092	25.3
		Corrientes, 1971	10,000-12,600	30	36	21,482	94,464,274	29.8
		N. Esperanza, 1980	10,200-10,700	1	3	875	4,869,684	44.0
		Pavayacu, 1972	9,600-11,300	11	14	3,198	16,486,097	30.2
		Selva Central		39	48	3,018	26,401,451	...
		Talara-Lima area, 1869	2,000- 9,000	2,159	6,068	23,756	954,030,859	34.1
		Valencia, 1975	10,500-11,200	1	2	4	535,748	44.0
		Yanayacu, 1974	11,400-13,600	6	9	928	4,111,104	19.1
		Total Peru		**3,478**	**8,430**	**143,205**	**1,727,368,879**	
PHILIPPINES	**ALCORN PHILIPPINES**	● Matinloc, 1978	6,656- 6,750	4	5	1,512	9,448,230	43.8
		● Nido, 1977	6,576- 6,885	3	5	448	15,797,886	27.1
		● North Matinloc, 1987	6,830- 7,021	2	2	877	319,934	43.2
		● Galoc, 1981	7,260- 7,280	1	1	1,051	383,460	37.2
	ALCORN PALAWAN	● Cadlao, 1977	5,734- 5,881	2	2	1,735	9,919,265	45.6
	TRANS-ASIA OIL & MINERAL DEVELOPMENT CORP.	● South Tara, 1987	4,335- 4,436	1	1	347	145,885	40.4
		Total Philippines		**13**	**16**	**5,970**	**36,014,660**	
QATAR(e)	**QGPC**	● Bul Hanine, 1970	6,000	14	15	346,000	4,171,621,000	35.0
		Dukhan, 1940	6,500	116	161			41.1
		● Idd El Shargi, 1960	4,500- 8,250	25	31			35.0
		● Maydan-Mahzam, 1963	7,000	19	24			38.0
		Total Qatar		**174**	**231**	**346,000**	**4,171,621,000**	
RAS al KHAIMAH(e)	**IPC**	● Saleh, 1983	14,500	6	6	10,000	16,491,000	50.0
		Total Ras al Khaimah		**6**	**6**	**10,000**	**16,491,000**	
SAUDI ARABIA(e)	**ARAMCO**	Abqaiq, 1940	6,690	588	588	4,946,000	55,957,450,000	37.0
		Abu-Hadriya, 1940	9,340					35.0
		Abu Jiffan	...					...
		● Abu-Safah, 1963	6,600					30.0
		Bakr	...					...
		● Berri, 1964	8,300					32.0-34.0
		Dammam, 1938	4,800					35.0
		Dhib	...					...
		Dibdibah	...					...
		Duhul	...					...
		El Haba	...					...
		Fadhili, 1949	8,050					39.0
		Farhah	...					...
		Faridah	...					...
		Ghawar, 1948	6,920					34.0
		Habari	...					...
		● Hamur	...					...
		Harmaliyah, 1971	8,430					35.0
		● Harqus	...					...
		● Hasbah	...					...
		Jaham	...					...
		Jaladi	...					...
		● Jana	...					...
		Jauf	...					...
		Jawb	...					...
		Juraybi'at	...					...
		● Jurayd	...					...
		● Karan	...					...
		Khurais, 1957	5,200					33.0
		Khursaniyah, 1956	6,560					31.0
		● Kurayn	...					...
		● Lawhah	...					...
		Lughfah	...					...
		● Maharah	...					...
		● Manifa, 1957	7,950					...
		● Marjan, 1967	6,800					33.0
		Mazalij	...					...
		Qatif, 1945	7,100					33.0-34.0
		Qirdi	...					...
		● Ribyan	...					...
		Rimthan	...					...

		Name of field, discovery date	Depth, ft	No. of wells Producing	No. of wells Total	Production 1988 average B/d	Production Cumulative to Dec. 31, 1988 Bbl	°API gravity
		• Safaniya, 1951	5,100					27.0
		Sahba	...					...
		Samin	...					...
		Sharar	...					...
		Suban	...					...
		Tinat	...					...
		Wari'ah	...					...
		Watban	...					...
		• Zuluf, 1965	5,800					32.0
		Total Saudi Arabia		**588**	**588**	**4,946,000**	**55,957,450,000**	
SHARJAH	**AMOCO**	Saaja and Moveyid, 1980	10,200-12,300	16	16	34,190	104,400,000	50.0
	CRESCENT[e]	• Mubarek,[c] 1972	...	4	4	30,810	96,936,260	37.0
		Total Sharjah		**20**	**20**	**65,000**	**201,336,260**	
SPAIN	**SHELL ESPANA**	• Amposta Marino Norte, 1970	10,000		8	730	55,667,000	37.0
		• Tarraco, 1973	9,000	...	3	...	14,547,000	35.0
	CHEVRON	Ayoluengo, 1964	4,600- 5,200	34	44	1,080	15,100,000	33.0
	REPSOL[e]	• Casablanca, 1975	8,900	7	9	27,190	108,098,000	32.6
		• Dorada, 1975	6,700	...	4			21.5
		• Gaviota,[c] 1980	8,300	3	3			52.7
		• Salmonete, 1984	12,600	...	1			44.0
		Angula, 1984	12,600	...	1			44.0
		Total Spain		**44**	**73**	**29,000**	**193,412,000**	
SURINAME	**STAATSOLIE**	Tambaredjo, 1981	1,040	99	99	3,380	3,481,700	15.9
		Total Suriname		**99**	**99**	**3,380**	**3,481,700**	
SYRIA	**AL FURAT OIL CO. (SHELL)**	Thayyem, 1983	...	...	...	62,780	57,577,000	36.5
		Ash Shola, 1985	...	...	...	410	150,000	37.0
		Elf Wafd North, 1986	...	...	...	18,400	6,734,000	38.1
		Al Ishara East, 1986	...	...	...	6,800	2,489,000	38.1
		Jido, 1986	...	...	...	4,800	1,757,000	33.0
		El Ahwar, 1986	...	...	...	6,900	2,525,000	34.0
	S.P.C.[e]	Alian, 1974	5,900	25	37	155,910	1,056,795,000	19.0
		Gbebeh, 1976	2,300	54	75			18.0
		Jebisseh, 1968	2,000- 3,300	132	219			18.0
		Karachok, 1956	6,500	103	119			20.0
		Rumilan, 1962	6,500	59	66			24.0
		Soudie, 1959	6,500	532	579			24.0
		Tichrine, 1976	2,600	58	73			18.0
		Total Syria		**963**	**1,168**	**256,000**	**1,128,027,000**	
THAILAND	**UNOCAL**	• Baanpot, 1980	7,000	24	29	2,296	2,018,300	54.6
		• Erawan, 1973	7,000	84	137	6,275	16,736,700	54.6
		• Platong, 1976	8,500	31	48	3,941	5,523,200	59.1
		• Satun, 1980	8,500	55	58	5,452	6,010,500	55.1
	THAI SHELL	Pru Krathiam, 1984	3,942	1	3	26	20,000	19.0
		Sirikit, 1981	5,258- 5,976	47	63	18,100	34,100,000	41.0
		Sirikit West, 1983	5,500	2	2	450	600,000	41.0
		Wat Taen, 1988	7,790	1	1	370	50,000	37.0-40.0
		Total Thailand		**245**	**341**	**36,910**	**65,058,700**	
TRINIDAD	**AMOCO**	• Cassia, 1973	12,700	9	8	5,556	12,564,000	45.0
		Mora, 1986	8,500	3	5	430	572,000	...
		• Poui, 1974	11,650	33	57	19,138	157,196,000	34.0
		• Samaan, 1971	11,780	37	54	13,497	179,069,000	36.8
		• Teak, 1971	15,191	54	97	31,464	239,499,000	29.3
	TNA	• Fortin Offshore (FOS), 1954	...	13	35	257	7,095,000	...
		• Soldado, 1955	11,000	366	655	38,106	476,627,000	...
	TRINTOPEC	Central Los Bajos, 1973	...	160	218	2,458	9,388,000	...
		Coora/Quarry, 1936	14,000	155	733	1,841	91,854,000	...
		Fyzabad/Apex/Quarry, 1920	11,000	318	1,039	3,765	171,928,000	...
		Galeota, 1963	6,304	49	105	2,404	16,098,000	...
		Palo Seco/Erin/McKenzie, 1926	12,718	529	1,576	8,641	120,163,000	...
		Other	...	209	914	2,651	71,330,000	...
	TRINTOC	Area IV & Guapo, 1913	10,626	80	192	1,166	39,136,000	...
		Barrackpore, 1911	11,100	79	369	3,036	31,928,000	...
		Brighton, 1908	7,500	64	619	624	70,474,000	...
		Catshill, 1950	9,693	32	134	315	23,143,000	...
		Forest Reserve, 1913	11,000	283	2,042	3,980	260,360,000	...

	Name of field, discovery date	Depth, ft	No. of wells Producing	Total	Production 1988 average B/d	Cumulative to Dec. 31, 1988 Bbl	°API gravity
	Guayaguayare, 1902	10,750	114	699	2,121	87,253,000	
	Oropouche, 1944	9,100	29	128	196	6,711,000	
	Palo Seco, 1929	12,700	86	933	2,073	93,881,000	
	Parrylands, 1913	10,626	119	508	1,596	40,711,000	
	Penal, 1936	11,067	76	289	989	62,404,000	
	Point Fortin C & W, 1907	10,626	124	551	1,968	41,427,000	
	Grand Ravine,* 1929	11,000	52	168	693	26,860	
	Trinity, 1956	9,700	18	95	239	15,218,000	
	Other		68	813	865	71,477,000	
P.C.O.L	All fields		96	494	773	20,851,000	
	Total Trinidad		**3,255**	**13,530**	**150,842**	**2,445,217,000**	

*Formerly Point Fortin East

TUNISIA

	Name of field, discovery date	Depth, ft	No. of wells Producing	Total	Production 1988 average B/d	Cumulative to Dec. 31, 1988 Bbl	°API gravity
ELF-ETAP	● Ashtart	10,500	15	20	25,008	182,579,582	29.8
ELF-SEREPT	Douleb/Semmama	3,937	12	15	638	17,941,594	40.0
	Tamesmida	3,937	2	2	204	2,086,622	36.9
SHELL	● Tazerka, 1979		5	5	3,610	14,621,000	30.0
ETAP-AGIP-FINA (SODEPS)	Debech, 1980	7,550	1	1	11	237,162	42.6
	Larich, 1979	7,550	2	2	20	250,782	40.7
	Makrouga, 1980	6,230	4	5	1,045	4,479,114	45.0
	El Hajeb, 1982	6,890	2	2		1,010,000	30.5
CFPT$^{(e)}$	Sidi El Itayem, 1971	7,500- 7,800	21	23			44.0
AGIP-TUNISIA (SITEP)$^{(e)}$	El Borma, 1964	8,250- 8,900	87	113	71,219	546,177,000	42.5
	Chouech es Saida, 1971	12,600	1	1			42.9
	Total Tunisia		**152**	**189**	**101,755**	**769,382,856**	

TURKEY

	Name of field, discovery date	Depth, ft	No. of wells Producing	Total	Production 1988 average B/d	Cumulative to Dec. 31, 1988 Bbl	°API gravity
ALADDIN MIDDLE EAST LTD.	Kahta, 1958	3,500	12	25	155	4,050,027	11.0
	Yasince, 1974	6,400	2	4	...	1,000	31.0
MOBIL	Bulgurdağ, 1960	4,300	2	2	40	2,481,657	37.2
	Selmo, 1964	5,800	20	20	4,008	66,786,785	34.2
SHELL	Barbes 4 Deep, 1971		18	22	1,610	16,289,000	37.2
	Baysu, 1985		6	7	960	751,000	34.5
	Bektas, 1985		1	1	220	381,000	34.7
	Beykan, 1964		38	48	2,650	59,770,000	33.2
	Cobantepe, 1975		...	...	50	218,000	29.5
	Katın, 1971		3	8	50	3,718,000	29.7
	Kayakoy, 1960		14	27	1,120	19,710,000	38.2
	Kayakoy West, 1964		19	29	3,300	30,308,000	34.1
	Kervan, 1982		...	...	10	4,000	30.3
	Kurkan, 1963		29	35	1,800	49,159,000	31.4
	Kurkan South, 1965		5	10	930	6,940,000	34.5
	Malatepe, 1970		14	15	1,010	7,670,000	32.7
	Pıyanko, 1968		1	3	50	1,518,000	35.3
	Sahaban, 1965		7	13	710	13,160,000	34.5
	Sahaban South East, 1983		2	2	190	370,000	34.5
	Sincan, 1979		8	9	740	3,071,000	31.4
	Yatır East, 1973		9	11	630	5,331,000	30.9
	Yenikoy East, 1974		2	2	1,040	4,281,000	31.3
	Yesıldere, 1985		3	3	300	310,000	34.5
TPAO	Adıyaman, 1971	5,800	8	8	540	8,235,615	27.6
	Akpınar, 1984	10,500	4	4	113	139,899	31.6
	Alcik, 1983	6,500	1	1	54	82,376	32.0
	B. Firat, 1986	8,150	11	11	1,870	1,447,728	34.8
	B. Kozluca, 1985	5,000	24	24	1,050	1,223,028	12.0
	B. Selmo, 1981	5,500	2	2	690	633,820	34.0
	Bati Raman, 1961	4,200	96	96	5,470	35,568,535	13.3
	Beycayır, 1976	7,700	1	1	45	197,316	26.1
	Bolukyayla, 1977	10,300	...	...	...	167,663	35.0
	Camurlu, 1976	5,600	20	20	560	1,033,511	12.2
	Celiklı, 1964	10,500	11	11	1,130	3,497,641	35.2
	Cemberlitas, 1983	6,500	22	22	3,170	7,190,561	30.5
	Cukurtas, 1985	10,000	1	1	33	212,189	36.0
	Devecatak, 1973	4,800	1	1	65	246,785	37.0
	G. Adıyaman, 1977	5,000	...	...	...	115,836	20.4
	G. Dıncer, 1981	5,350	10	10	750	4,532,209	16.7
	G. Kayaköy, 1976	8,600	4	4	520	2,195,433	30.4
	G. Sahaban, 1978	5,450	13	13	1,025	2,940,261	33.2
	G. Sarıcak, 1973	5,250	13	13	819	4,107,220	31.5
	Garzan, 1956	4,700	19	19	1,290	32,942,472	26.2
	Germık, 1968	6,500	10	10	280	3,400,925	18.8
	Ikiztepe, 1976	4,900	...	7	...	88,051	11.3
	Karakus, 1988	8,850	1	1	2,410	70,813	30.0
	K. Osmancık, 1971	3,800	2	2	220	2,089,303	37.6
	Kartaltepe, 1982	6,550	3	3	369	884,372	32.0
	Kurtalan, 1961	5,750	1	1	24	242,639	31.9
	Kuzey Adıyaman, 1977	9,500	...	...	...	59,375	32.0
	Mağrıp, 1961	5,700	10	10	680	14,871,144	18.4
	Mehmetdere, 1982	6,700	1	1	23	156,982	31.0

				No. of wells		Production		
		Name of field, discovery date	Depth, ft	Producing	Total	1988 average B/d	Cumulative to Dec. 31, 1988 Bbl	°API gravity
		Oyuktas, 1972	7,600	...	...	...	592,005	31.0
		Raman, 1940	4,500	83	83	4,810	50,390,274	18.7
		S. Sinan, 1987	3,900	4	4	230	60,282	13.0
		Saricak, 1973	5,250	5	5	300	2,656,363	31.5
		Sezgin, 1970	5,600	...	...	...	87,559	17.0
		Silvanka, 1962	8,200	8	8	840	7,913,037	23.0
		Sivritepe, 1977	8,200	1	1	180	546,468	33.4
		Yeniköy, 1973	6,400	20	20	1,740	9,061,449	31.4
		Total Turkey		**625**	**713**	**52,873**	**496,159,608**	
UNITED KINGDOM	**AMOCO**	● Montrose, 1969	8,200	15	21	9,845	78,284,350	40.5
		● NW Hutton, 1975	12,000	26	35	30,396	92,242,161	36.0
	ARCO	Thames,[illegible] 1973	7,892	6	7	180	168,000	48.8
	BP	Beatrice, 1976	6,750	27	39	30,580	100,350,000	38.4
		● Buchan, 1974	8,700	9	9	21,000	66,828,790	33.0
		Clyde, 1978	12,400	10	30	51,443	30,748,221	38.1
		Deveron, 1972	9,000	3	3	4,931	9,964,220	38.2
		East Midlands, 1939	3,500	65	132	1,098	23,656,869	36.0
		● Forties, 1970	7,000	79	103	290,005	1,909,000,000	37.0
		Kimmeridge, 1959	1,705	1	1	78	2,848,085	40.0
		● Magnus, 1974	9,500	11	11	140,830	244,300,000	39.0
		Nettleham, 1983	8,850	1	2	430	491,400	35.0
		Stainton, 1984	5,200	1	3	54	50,539	...
		Scampton, 1985	5,360		3	10	30,367	...
		Thistle, 1973	9,000	33	52	52,177	335,372,988	38.0
		Welton, 1981	5,000			2,390	2,473,754	36.0
		Wytch Farm Bridport Sand, 1974	3,031	10	16	2,915	9,357,081	37.0
		Wytch Farm Sherwood Sandstone, 1978	5,198	5	5	7,165	7,897,508	37.9
	CHEVRON	● Ninian, 1974	10,000	69	103	141,773	811,530,963	35.0
	CONOCO	● Dunlin, 1973	9,100	26	33	52,466	272,071,000	36.0
		● Hutton, 1973	10,000	12	28	63,012	102,373,294	33.0
		● Murchison, 1975	9,900	14	22	45,981	202,267,164	38.0
		● Statfjord, 1974	9,500	9	14	112,745	234,706,984	39.0
	HAMILTON BROS. OIL & GAS LTD.	● Argyll, 1971	9,000- 9,400	7	7	7,551	66,116,334	38.0
		● Duncan, 1980	9,600-10,000	3	3	2,717	17,451,521	36.0
		● Innes, 1983	12,300-12,600	2	2	1,846	5,006,437	45.0
	MARATHON	● South Brae Crude Oil, 1975	12,700-13,437	19	27	91,164	175,283,680	35.0
		● North Brae Condensate, 1975	11,900-12,475	7	10	30,537	11,176,875	45.0
	MOBIL	● Beryl, 1972	9,900-11,500	42	61	99,006	391,470,893	37.4
		● Ness, 1986	9,900-10,112	2	3	16,369	8,228,182	37.5
	OCCIDENTAL	● Claymore, 1974	8,100	*27	28	68,151	322,992,075	30.1
		● Piper, 1973	8,100	*25	25	113,088	830,730,000	37.0
		● Scapa, 1981	8,100	*4	4	25,675	16,955,490	32.0
	SHELL	● Auk, 1971	...	9	11	9,840	80,601,000	38.0
		● Brent, 1971	...	53	130	334,970	1,182,899,000	40.0
		● Cormorant North, 1974	...	13	28	86,000	186,276,000	34.9
		● Cormorant S. & C., 1972	...	17	37	122,400	143,698,000	36.0
		● Dunlin A, 1973	...	26	40	49,180	268,100,000	36.0
		Eider, 1976	...	...	...	2,730	999,000	34.0
		● Fulmar, 1975	...	13	28	152,380	319,171,000	40.0
	PHILLIPS	● Maureen, 1973	8,000- 8,700	3	12	56,821	135,832,613	35.9
	TEXACO NORTH SEA	● Highlander, 1976	8,759- 9,372	4	6	13,330	32,564,968	34.0-37.0
		● Petronella, 1975	8,110	1	1	7,080	6,620,774	40.1
		● Tartan, 1974	10,217-12,614	7	16	16,071	66,473,490	37.0-42.0
	TOTAL OIL MARINE	● Alwyn North, 1975	10,170-11,155	10	28	74,690	26,011,000	40.0-41.0
	UNOCAL	● Heather, 1973	10,800	29	40	14,417	79,579,307	34.3
		Total United Kingdom		**755**	**1,219**	**2,457,517**	**8,920,251,377**	
YEMEN, NORTH	**HUNT OIL**	Alif, 1984	5,750	47	56	145,000	62,509,000	40.0
		Azal, 1987	6,850	11	12	14,000	5,143,000	40.0
		Jahal, Nuqum, 1988	3,780	1	1	13	5,000	44.0
		Saif Ben The-Yazen, 1988	7,600	1	1	3	1,000	40.0
		Total North Yemen		**60**	**70**	**159,016**	**67,658,000**	
VENEZUELA	**PDVSA/ZULIA**	Alturitas	...	5	14	2,025	2,426,806	...
		Bachaquero, 1930	10,720	2,332	4,826	148,008	5,195,115,462	23.2
		Boscan, 1946	9,708	95	478	28,171	740,411,326	10.4
		Cabimas, 1917	2,200	635	1,246	52,317	488,083,404	22.8
		Centro, 1959	9,600-11,000	224	242	140,840	890,046,567	36.2
		Ceuta	16,380	109	179	57,524	467,767,396	30.6
		Cruces-Manueles, 1916	3,000- 8,000	51	133	4,860	174,890,768	39.2
		La Concepcion, 1953	3,148- 8,000	31	162	3,519	137,539,434	34.5
		La Paz, 1925	4,268- 8,000	54	154	10,239	858,815,430	30.6
		Lago, 1959	11,450	30	66	14,237	1,705,670,444	32.0
		Lagunillas, 1926	3,000	3,204	5,248	364,373	3,944,381,124	25.6
		Lama, 1957	8,320	257	406	134,626	2,497,044,571	32.5
		Lamar, 1958	13,000	108	182	65,769	213,068,990	35.5
		Mara, 1945	5,240	37	105	8,084	409,148,627	24.0

*Number of wells producing before system shut down in July 1988.

	Name of field, discovery date	Depth, ft	No. of wells Producing	No. of wells Total	Production 1988 average B/d	Production Cumulative to Dec. 31, 1988 Bbl	°API gravity
	Mene Grande, 1914	4,130	107	583	2,738	638,647,336	18.4
	Motatan, 1952	...	25	31	35,156	84,677,840	20.2
	Sibucana, 1948	13,450	...	1	35	43,418,969	30.8
	Tia Juana, 1928	3,000	2,199	3,099	166,446	10,420,973,669	18.2
	Urdaneta, 1970	10,000	205	283	46,821	139,597,000	26.7
	West-Tarra, 1942	4,250- 5,500	19	44	2,831	62,723,458	39.2
	Other		23	37	20,043	114,652,173	...
PDVSA/ ANZOA-TEGUI	Adjuntas, 1957	5,000	18	52	17	—	13.9
	Arecuna	1,300	61	118	4,163	9,187,917	11.2
	Bare	1,110	157	273	11,580	19,385,840	10.3
	Boca, 1971	9,500	16	80	1,853	81,100,873	32.2
	Caico Seco, 1946	6,500- 7,300	21	108	49	8,843,945	33.1
	Chimire, 1948	7,000- 7,200	44	203	5,514	259,071,793	34.6
	Dacion, 1957	6,700	84	140	7,508	226,672,642	21.8
	El Roble, 1939	3,500-11,500	22	55	2,270	39,070,536	50.0
	El Toco	2,300	35	45	2,569	31,048,853	52.2
	Elias, 1954	5,000- 6,470	90	168	7,743	427,758,064	347.5
	Guara, 1946	5,000-10,000	195	373	10,968	428,935,445	25.7
	Guario, 1940	3,400	18	62	1,259	43,505,786	43.8
	Inca, 1948	7,250	20	56	59	1,566,637	28.2
	Isla, 1954	...	8	19	4,898	59,692,850	43.5
	La Ceiba, 1946	9,450	24	36	2,371	48,447,502	42.4
	La Ceibita, 1963	9,878	23	47	1,910	65,586,098	41.8
	Leona, 1938	2,200-12,800	128	301	1,879	51,513,802	24.7
	Mata, 1954	8,970-10,516	90	396	11,171	22,387,507	32.5
	Merey, 1937	5,400- 5,700	339	604	338	35,061,337	12.4
	Nipa, 1945	6,000- 8,500	62	297	8,678	166,688,656	28.0
	Oficina, 1937	5,900	207	488	2,148	381,978,180	22.6
	Oscurote-Norte, 1952	9,513	14	77	1,875	110,423,465	19.2
	Pato Este, 1988	...	1	1	60	21,960	41.4
	San Joaquin, 1939	6,550	62	101	7,034	110,616,825	48.8
	Soto, 1950	9,500	14	85	495	95,823,699	37.8
	Sta. Ana, 1936	8,500	54	103	4,095	121,177,758	42.6
	Sta. Rosa, 1941	8,500	173	212	9,832	393,600,652	50.4
	Yopales, 1937	4,600	96	261	8,712	130,508,374	23.6
	Zanjas, 1958	13,270	11	17	1,280	40,719,382	41.0
	Zapatos, 1955	11,500	32	60	2,731	257,250,254	35.9
	Zorro, 1953	11,100	10	26	1,835	75,299,775	35.9
	Zulus, 1957	12,710	8	23	995	23,649,286	42.1
	Zumo, 1954	9,200	9	35	1,760	78,128,578	26.3
	Other		99	376	7,790	394,856,543	...
PDVSA/MONAGAS	Acema, 1960	...	23	55	9,983	53,511,562	29.0
	Acema-Casma	4,023	52	84	18,742	79,016,166	24.1
	Aguasay Norte/Sur, 1955	4,849	6	18	2,850	21,633,377	45.4
	Cerro Negro	1,200	34	296	9,047	2,388,417	8.6
	Furrial, 1986	...	15	15	65,966	30,401,817	26.8
	Jobo, 1956	3,600- 4,000	170	432	30,535	279,916,844	11.0
	Mata Acema, 1951	...	28	61	8,245	91,605,715	24.0
	Morichal, 1958	3,312	27	191	3,854	171,514,235	8.7
	Onado, 1971	4,791	14	26	2,171	19,173,594	27.7
	Oritupano, 1950	7,657	30	65	4,152	37,469,018	19.1
	Oritupano Norte/Sur, 1954	...	33	150	10,065	148,165,969	28.4
	Orocual, 1953	2,954	11	57	3,143	30,202,896	25.1
	Pilon, 1937	...	58	139	9,368	153,976,763	12.3
	Pirital, 1958	450- 1,100	7	82	342	27,535,222	30.2
	Quiriquire, 1928	7,000- 7,200	4	474	1,584	760,830,140	23.5
	Sta. Barbara, 1941	5,020- 6,500	6	329	581	167,326,700	24.2
	Tacat, 1953	1,820- 3,670	...	131	232	45,210,089	18.2
	Temblador, 1936	3,500- 4,500	13	49	580	109,316,573	19.5
	Aguasay, 1955	8,100-13,400	6	43	1,412	81,041,846	31.1
	Carisito, 1984	...	5	7	7,107	3,698,019	42.5
	Carito, 1988	...	3	—	5,285	1,929,157	
	Other	...	14	25	889	121,092,000	
PDVSA/BARINAS	Hato, 1965	9,550	12	18	2,059	44,126,518	24.4
	Maporal, 1957	10,950	12	15	3,486	16,276,389	26.7
	Paez, 1963	...	47	67	9,365	56,743,336	19.6
	Silvan, 1949	10,860	14	22	3,637	49,866,619	29.0
	Silvestre, 1948	8,860	16	48	3,128	137,394,756	23.6
	Sinco, 1953	8,500- 9,100	44	84	7,851	267,708,664	23.7
	Guafita, 1984	...	17	18	45,694	28,995,230	29.0
	La Victoria, 1987	...	3	3	4,135	1,753,137	33.9
	Other	...	3	7	374	13,426	25.9
PDVSA/GUARICO	Barzo, 1959	...	3	6	197	4,076,785	29.0
	Bella Vista, 1952	...	10	86	658	12,587,346	21.6
	Budare, 1958	4,523	26	42	6,734	68,899,777	29.6
	Jobal, 1960	...	6	12	107	2,165,110	36.3
	Las Mercedes, 1942	4,500	...	184	—	91,318,000	22.8
	Ruiz, 1949	4,500	...	42	—	33,185,000	29.9
	Saban, 1947	...	14	70	258	22,138,234	41.1
	Other	...	13	28	688		
PDVSA/AMACURO	Tucupita, 1945	...	...	48	—	67,074,000	16.6

				No. of wells		Production		
		Name of field, discovery date	Depth, ft	Producing	Total	1988 average b/d	Cumulative to Dec. 31, 1988 bbl	°API gravity
	PDVSA/FALCON	All fields, 1920	...	...	135	146	107,226,375	27.4
		Total Venezuela		**12,857**	**26,481**	**1,730,751**	**38,937,210,057**	
WEST GERMANY	**DEB**	Annaveen, 1963	4,428	3	4	18	500,475	33.8
		Barenburg, 1953	2,300- 3,300	43	72	2,019	40,010,907	29.0
		Barver, 1963	3,640	3	5	32	491,944	32.8
		Bodenteich, 1960	4,641	1	2	17	354,859	31.1
		Eich, 1983	5,995	6	8	1,984	1,499,964	38.9
		Eilte-West, 1956	6,051	12	16	101	3,602,772	32.8
		Eldingen, 1949	5,028	36	44	689	20,998,652	35.5
		Elsfleth, 1956	5,175	3	13	38	2,847,869	25.7
		Eystrup 2, 1960	3,526	...	1	18	444,798	17.4
		Eystrup 3-6, 1959	1,075	4	4	102	1,147,134	17.4
		Eystrup-Verden, 1977	3,526	1	1	9	179,950	17.1
		Georgsdorf, 1944	1,800- 2,600	203	372	5,191	102,070,815	24.0-29.0
		Gross Lessen, 1969	3,300	7	11	704	21,480,891	...
		Hankensbüttel, Mitte, 1954	5,182	6	8	306	4,392,124	33.0
		Hankensbüttel-Nord, 1955	5,182	4	4	260	6,313,863	33.0
		Hankensbüttel, Ost, 1954	5,182	1	1	54	1,273,376	33.0
		Hebelermeer, 1955	3,899	9	15	117	4,523,492	27.3
		Hillerse-Nord, 1958	2,683	1	1	13	769,438	31.5
		Hillerse-West, 1957	6,077	1	1	1	29,116	43.1
		Hohenassel, 1943	1,705	9	22	30	3,549,903	30.4
		Hohnebostel, 1969	8,341	3	6	67	1,206,211	41.0
		Königsgarten, 1984	6,235	3	3	202	124,724	38.1
		Lingen-Dal. (incl. Wd), 1942	3,129	56	139	175	16,946,869	31.1
		Lüben-West, 1958	4,690	5	6	125	1,537,810	36.9
		Lüben, 1955	3,950	8	11	639	12,231,671	35.0-38.0
		Meerdorf, 1954	6,077	13	26	84	1,610,217	43.1
		Meppen-Schwefingen, 1959	4,257	22	24	941	12,510,305	29.8
		Mölme-Feldbergen, 1934	1,410	2	2	12	592,684	31.1
		Mölme-Wachtel, 1934	3,886	2	12	3	902,921	36.9
		Nienhagen, 1909	3,079	9	26	127	26,835,081	29.6
		Nienhagen-Dachtmissen, 1959	3,427	4	8	74	1,014,385	27.8
		Pfullendorf-Ostrach, 1962	3,558	15	24	132	2,527,335	37.7
		Pötrau, 1959	5,248	...	2	...	31,121	14.3
		Rühlermoor-Malm, 1962	4,519	4	8	108	6,465,339	31.7
		Ruehme, 1954	1,950	37	48	742	10,470,379	...
		Rühlermoor-Valendis, 1949	2,381	261	448	10,031	135,762,573	24.6
		Steimbke-Alt + Nord, 1935	1,246	17	36	84	7,729,084	20.6
		Steimbke-Lichtenmoor, 1943	2,722	16	31	118	3,980,805	17.4
		Steimbke-Ost, 1959	4,428	3	9	55	3,818,117	30.5
		Stockstadt, 1952	5,402	9	21	105	7,706,268	39.6
		Suderbruch, 1949	5,175	42	67	521	23,560,473	31.1
		Sulingen, 1973	3,345	9	9	470	5,192,086	30.0
		Varel, 1957	5,084	6	14	140	5,740,719	25.5
		Varloh, 1984	4,129	6	6	180	299,162	31.5
		Volkensen, 1960	7,540	4	4	74	779,122	22.9
		Wald, 1966	3,116		4		51,025	28.2
		Wehrbleck, 1957	3,342	49	65	667	16,639,749	32.0
		Wietingsmoor, 1954	2,820	23	31	524	13,212,159	30.5
	DST	Bramberge, 1958	2,560- 3,300	57	82	5,734	103,742,201	29.0
		Fronhofen, 1964	3,800	10	15	229	2,444,201	37.0
		Illmensee, 1967	3,800	2	5	69	1,009,107	37.0
		Markdorf, 1960	7,700		1		13,912	37.0
		Memmingen-M, 1958	5,000		7		446,484	37.0
	MOBIL ERDGAS-ERDÖL GMBH (MEEG)	Bavaria	4,660- 6,190	...	29		7,526,952	20.0-25.0
		Hannover	980- 6,630	51	70	855	31,000,969	25.0-35.0
		Hofolding, 1980	11,100	3	3	396	995,735	28.0-30.0
		Süd-Oldenburg, 1950	2,630- 6,800	70	147	1,129	39,930,724	31.0-39.0
		Voigtei, 1953	980- 1,900	76	107	632	25,154,139	32.0-34.0
		Weser Ems	2,000- 2,450	19	25	332	6,105,591	23.0
	RWE-DEA A.G. Aktiengesellschaft für Mineraloel und Chemie	Boostedt, 1952	5,900	23	45	562	18,385,364	32.0
		Hankensbuettel-Sued, 1954	4,900	39	81	2,104	82,585,996	27.0-35.0
		Hardesse, 1957	8,200	29	68	496	8,848,502	40.0
		Hohne, 1951	5,250	26	55	822	40,939,178	33.0
		Leiferde, 1956	2,600	19	42	358	20,391,970	33.0
		● Mittelplate, 1987	7,500- 9,350	4	4	4,230	1,851,528	19.3
		Oerrel-Sued, 1954	4,600	23	46	875	11,723,352	26.0
		Ploen-Ost, 1958	8,850	29	83	997	51,080,469	33.0
		Preetz, 1962	8,200	16	33	315	11,642,420	26.0
		Schwedeneck-See, 1978	4,900	15	15	8,035	10,549,683	28.0
		Wesendorf, 1943	4,650	15	36	348	17,522,066	25.0-40.0
		Other, 1935	2,300- 8,200	18	73	472	31,136,125	19.0-37.0
	WINTERSHALL A.G.	Aitingen, 1977	6,232	4	4	1,021	4,327,565	31.1
		Aldorf, 1952	4,100	48	103	468	17,094,105	33.0
		Arlesried, 1964	4,920- 8,550	13	18	516	14,020,175	38.5
		Bockstedt, 1954	4,264	33	48	940	20,822,954	27.4
		Dickel, 1953	3,936	33	61	340	6,719,051	28.3
		Dueste, 1954	3,936	28	71	86	12,151,647	33.0
		Eicklingen, 1937	2,460	9	13	48	3,661,606	30.0
		Emlichheim, 1944	3,116	84	162	3,126	44,426,686	24.5

				No. of wells		Production		
		Name of field, discovery date	Depth, ft	Producing	Total	1988 average B/d	Cumulative to Dec. 31, 1988 Bbl	°API gravity
		Hauerz, 1985	8,639	4	4	156	251,379	40.4
		Kirchdorf, 1982	5,737	1	1	11	56,660	38.5
		Landau, 1955	3,936	77	81	1,258	27,096,512	36.9
		Maximiliansau, 1959	2,100- 5,363	...	...	...	14,387	41.0
		Meckelfeld, 1954	6,396	17	28	298	14,026,880	27.5
		Moenchsrot, 1958	5,248	16	23	297	10,573,258	38.1
		Nienhagen, 1925	3,729	12	12	69	10,921,868	30.0
		Oberschwarzach, 1978	4,920	4	5	141	669,225	37.7
		Pattensen, 1954	2,165	6	7	55	1,058,857	29.3
		Rheinzabern, 1959	3,750- 5,576	...	1	...	27,041	37.9
		Ruehlertwist, 1949	2,350- 2,900	71	135	1,631	31,589,723	25.0
		Ruelzheim, 1984	7,544	...	2	...	40,818	37.7
		Schwabmunchen, 1976	4,428	...	1	1	39,491	25.7
		Schwedeneck, 1956	5,182	13	30	198	5,210,471	27.5
		Wathlingen, 1939	2,624	7	9	22	1,413,300	30.0
	OTHER OPERATORS(e)	Scheerhorn, 1949	3,550- 3,750	932	1,630	10,000	278,600,000	30.0
		Reitbrook, 1937	1,450- 2,100					29.0
		Oelheim-Sued, 1968	7,650					33.0
		Sinstorf, 1960	6,750- 7,150					
		Vorhop, 1952	2,950- 6,900					36.0
		Total West Germany		**2,917**	**5,216**	**77,775**	**1,565,801,061**	
YEMEN, NORTH	HUNT OIL	Alif, 1984	5,700	12	76	18,800	9,514,000	40.0
		Azal, 1987	6,850	...	9	...	...	40.0
		Total North Yemen		**12**	**85**	**18,800**	**9,514,000**	
YUGOSLAVIA	INA-NAFTAPLIN	Beničanci, 1966	6,752- 5,938	29	72	9,641	104,033,394	30.2
		Bilogora, 1966	3,346- 5,052	43	60	850	8,059,436	40.8
		Bokšić-Klokočevci, 1975	7,218-10,171	11	19	183	191,385	31.0
		Bunjani, 1951	1,800- 2,550	27	36	79	2,489,731	30.2
		Crnac, 1977	6,814- 8,061	2	2	96	104,437	34.6
		Dugo Selo, 1953	3,445- 4,183	13	15	451	9,613,991	31.1
		Deletovci, 1982	3,143- 3,422	42	46	4,015	4,706,914	28.9
		Ferdinandovac, 1959	5,625- 5,915	5	6	106	1,249,546	36.0
		Ilača, 1982	3,445- 3,855	8	12	340	275,274	31.1
		Ivanić Grad, 1959	5,282- 5,709	46	85	3,488	42,879,411	33.4
		Jagnjedovac, 1961	2,864- 3,570	30	32	508	6,226,162	33.0
		Jamarice, 1965	3,281- 5,512	89	117	2,577	13,254,558	37.6
		Ježevo, 1963	6,234- 7,382	7	8	103	826,333	36.7
		Kloštar, 1952	2,297- 4,593	79	121	1,182	40,055,407	36.3
		Kozarice, 1972	3,281- 3,609	19	22	479	1,484,058	23.6
		Križ, 1948	1,600- 2,250	42	110	111	6,461,906	17.4
		Kučanci-Kapelna, 1973	6,562- 7,218	12	14	1,191	882,075	25.2
		Lacići, 1979	7,605- 8,012	7	18	2,245	3,522,104	35.6
		Lepavina, 1969	1,790- 2,200	8	11	161	730,266	22.8
		Lipovljani, 1960	3,937- 5,709	82	104	2,261	21,215,408	36.7
		Lupoglav, 1971	3,860- 5,600	5	6	65	106,604	33.4
		Mihovljani, 1973	5,150- 5,760	5	5	71	25,872	32.5
		Mramor Brdo, 1949	2,625- 4,101	10	19	62	4,521,950	31.1
		Obod, 1967	6,378- 7,550	2	8	167	2,167,387	32.5
		Okoli, 1962	7,382- 8,366	3	9	...	516,995	35.5
		Privlaka, 1983	2,933- 3,041	9	11	861	1,039,754	25.9
		Stružec, 1956	2,362- 3,773	71	107	5,565	99,286,119	38.8
		Sandrovac, 1962	2,250- 3,700	104	153	4,773	36,419,681	37.8
		Števkovica, 1978	7,710- 9,843	24	33	805	3,520,690	31.9
		Vezišće, 1965	6,135- 6,562	5	16	20	41,054	34.6
		Žutica, 1963	5,742- 6,923	147	186	9,070	83,240,076	33.8
		Kalinovac,(c) 1978	11,841-14,682	13	19	3,964	3,031,115	51.5
		Molve,(c) 1974	10,263-11,345	14	20	1,297	1,749,175	57.2
		Okoli,(c) 1962	7,218- 7,874	11	15	890	560,714	80.6
		Other,(c)	5,250-11,800	8	15	290	64,366	87.9
	OTHER OPERATORS(e)	All fields	...	...	...	16,000	139,000,000	
		Total Yugoslavia		**1,032**	**1,532**	**73,967**	**643,553,348**	
ZAIRE	CHEVRON	● GCO, 1970	7,000- 9,000	4	8	122	6,333,284	38.7
		● Libwa, 1981	5,500	...	2	...	...	33.0
		● Lukami, 1983	8,000-12,400	4	5	1,976	6,892,135	33.2
		● Mibale, 1973	5,000- 6,000	8	8	10,743	85,192,911	30.0
		● Motoba, 1976	11,098	4	7	5,048	1,469,530	31.5
		● Mwambe, 1979	6,150	2	2	124	624,248	29.7
	ZAIREP (FINA)	East Mibale, 1978	6,000		1		398,000	34.0
		Kifuku, 1983	3,400	1	1	20	45,000	31.0
		Kinkasi, 1972	3,700	39	42	2,754	7,303,000	31.0
		Liawenda, 1972	3,900	27	32	1,799	3,475,000	31.0
		Makelekese, 1983	3,600	8	8	427	894,000	31.0
		Muanda, 1972	3,600	6	6	409	686,000	31.0
		Nsiamfumu, 1977	8,300		1		5,000	34.0
		Tshiende, 1978	6,000	4	7	5,728	6,028,000	34.0
		Total Zaire		**107**	**130**	**29,150**	**119,286,108**	

Worldwide refining

LOU ANN THRASH
DIRECTOR OF EDITORIAL SURVEYS

All figures in barrels per calendar day

All figures are
as of 1-1-90

LEGEND

Numbers identify processes in table

Thermal processes
1. Gas oil cracking
2. Thermal cracking
3. Visbreaking
4. Fluid coking
5. Delayed coking
6. Other

Catalytic cracking
1. Fluid
2. Other

Catalytic reforming
Semiregenerative:
  1. Conventional catalyst
  2. Bimetallic catalyst
Cyclic:
  3. Conventional catalyst
  4. Bimetallic catalyst
Other:
  5. Conventional catalyst
  6. Bimetallic catalyst

Catalytic hydrocracking
1. Distillate upgrading
2. Residual upgrading
3. Lube-oil manufacturing
4. Other

Catalytic hydrorefining
1. Residual desulfurization
2. Heavy gas oil desulfurization
3. Cat cracker and cycle stock feed pretreatment
4. Mid distillate
5. Other

Catalytic hydrotreating
1. Pretreating cat reformer feeds
2. Naphtha desulfurizing
3. Naphtha olefin or aromatics saturation
4. Straight-run distillate
5. Other distillates
6. Lube oil "polishing"
7. Other

Alkylation
1. Sulfuric acid
2. Hydrofluoric acid

Aromatics/Isomerization
1. BTX
2. Hydrodealkylation
3. Cyclohexane
4. C_4 feed
5. C_5 feed
6. C_5 and C_6 feed

Hydrogen
1. Steam methane reforming
2. Steam naphtha reforming
3. Partial oxidation
4. Cryogenic
5. Other

Calendar-day figures reported in this survey are the average volume a refinery unit processes each day including downtime used for turnarounds. This is actual total volume for the year divided by 365. (Stream day figures represent the amount a unit can process when running full capacity for short periods.)

INACTIVE REFINERIES

Germany
1. Wintershall Aktiengesellschaft, Mannheim, no crude distillation, Jan. 1989.

Survey of operating refineries worldwide (capacities as of Jan. 1, 1990)

			Charge capacity, b/cd							Production capacity, b/cd					
Country	No. plants	Crude, b/cd	Vacuum distillation	Thermal operations	Catalytic cracking	Catalytic reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Abu Dhabi	2	180,000	46,000	....	....	30,100	27,000	21,900	78,600	....	....	....	....	53.0	....
Algeria	4	464,700	15,000	....	....	55,600	....	....	23,600	....	1,900	2,400	5,300	....	....
Angola	1	32,100	1,900	....	....	1,900	....	2,800	3,800	....	....	....	950	....	....
Argentina	11	688,700	259,400	125,200	124,700	40,800	23,900	....	63,000	6,850	....	5,650	21,800	19.0	1,000
Australia	10	675,000	158,800	....	194,700	164,000	....	33,700	259,700	55,750	12,800	13,200	19,200	....	....
Austria	1	204,000	68,000	23,426	24,000	32,000	7,700	68,000	49,300	....	9,000	2,300	5,850	....	....
Bahrain	1	243,000	156,000	20,000	39,000	18,000	....	50,000	40,000	1,300	....	....	5,000	32.2	....
Bangladesh	1	31,200	3,530	....	....	1,650	....	2,430	1,940	....	....	....	1,200	....	....
Barbados	1	3,000	....	....	....	....	....	....	....	....	....	....	....	....	....
Belgium	4	613,500	298,300	62,800	104,700	81,400	....	201,100	182,700	7,710	....	....	25,300	46.0	....
Bolivia	3	57,500	2,961	....	....	14,900	....	....	15,379	....	....	377	....	....	....
Brazil	13	1,397,100	749,100	38,300	331,100	21,000	....	....	135,250	8,700	2,650	16,000	33,950	20.1	1,267
Brunei	1	10,000	....	....	....	....	....	....	....	....	....	....	....	....	....
Cameroon	1	43,020	....	....	....	6,920	....	10,700	9,680	....	....	....	....	....	....
Canada	28	1,851,800	642,950	88,250	387,470	372,450	206,350	51,000	735,060	71,145	58,870	17,360	110,500	309.2	756
Chile	3	146,800	74,600	20,000	38,870	10,000	....	....	6,000	1,000	....	....	1,100	....	....
Colombia	4	227,400	120,000	60,000	91,000	6,000	....	....	34,240	11,300	5,100	2,300	2,400	21.0	....
Congo	1	21,000	8,000	....	....	2,000	2,000	....	3,500	....	....	....	....	....	....
Costa Rica	1	16,200	600	6,500	....	1,200	....	....	3,400	....	....	....	300	....	....
Cyprus	1	18,000	2,600	....	....	4,300	....	....	7,750	....	....	....	1,200	....	....
Denmark	3	186,500	41,050	73,670	....	31,100	....	13,000	86,200	....	4,000	....	8,000	....	....
Dominican Republic	2	48,500	....	....	....	9,000	....	....	23,700	....	....	....	....	0.8	....
Ecuador	5	145,000	40,025	21,126	16,000	2,800	....	....	....	....	....	....	....	....	....
Egypt	8	489,203	46,725	16,470	....	30,940	....	....	84,386	804	1,452	3,848	6,633	5.5	541
El Salvador	1	17,000	1,200	....	....	3,200	....	....	12,000	....	....	....	....	....	....
Ethiopia	1	18,000	1,600	....	....	2,270	....	....	....	....	....	....	....	....	....
Finland	2	241,000	81,400	46,300	41,800	42,900	14,200	104,500	57,930	7,980	3,600	....	11,800	20.0	....
France	14	1,819,900	660,500	152,850	325,500	247,400	13,500	269,900	514,600	10,150	25,960	31,600	59,650	28.0	....
Gabon	1	24,000	....	7,200	....	1,400	....	....	3,600	....	....	....	....		
East Germany	9	795,000	142,000	41,500	36,000	42,500	....	40,000	115,000	5,200	12,800	8,700	9,500	....	100
West Germany	16	1,507,200	771,500	283,262	182,700	283,300	108,200	435,500	503,400	12,650	61,630	13,200	78,500	392.5	3,305
Ghana	1	26,600	....	....	....	5,850	....	....	5,850	....	....	....	....	....	....
Greece	4	384,500	118,100	41,120	50,500	51,300	....	41,100	100,200	5,700	4,250	3,100	5,600	9.1	....
Guatemala	1	16,000	....	....	....	3,000	....	....	5,000	....	....	....	....	....	....
Honduras	1	14,000	....	....	....	1,800	....	....	5,000	....	....	....	....	....	....
Hungary	3	220,000	120,000	13,300	20,000	23,000	....	....	76,600	3,300	9,800	4,000	10,800	....	....
India	12	1,079,842	334,200	110,670	136,370	26,230	....	13,800	71,231	....	4,250	13,800	40,453	95.75	881
Indonesia	6	714,200	227,000	81,700	12,600	61,500	100,100	18,000	51,500	600	....	5,000	7,500	130.8	....
Iran	4	530,000	215,200	80,800	....	63,845	93,180	3,120	34,225	....	....	6,000	12,450	70.0	....
Iraq	8	318,500	82,650	....	....	43,500	38,000	100,000	13,000	....	....	10,168	6,715	64.0	....
Ireland	1	56,000	....	....	....	11,000	....	5,500	11,000	....	....	....	....	....	....
Israel	2	180,000	95,000	67,000	24,000	26,000	....	48,000	32,000	....	....	....	3,000	....	....
Italy	21	2,803,600	687,400	412,900	305,700	334,850	59,000	376,300	675,900	41,700	82,550	33,610	156,370	85.9	1,350
Ivory Coast	2	69,000	37,500	....	....	13,600	14,200	12,800	21,000	....	....	....	5,000	....	....
Jamaica	1	34,200	1,900	....	....	3,240	....	....	19,350	....	....	....	....	....	....
Japan	41	4,198,450	1,654,140	85,800	617,225	531,800	152,750	1,279,040	1,964,315	30,880	58,200	47,805	75,730	955.7	500
Jordan	1	100,000	16,500	....	4,250	8,640	4,800	....	14,850	....	....	....	4,000	7.9	....
Kenya	1	90,000	1,700	....	....	9,000	....	....	33,000	....	....	....	900	....	....
Korea	6	867,000	83,400	48,700	....	62,450	29,000	21,000	110,800	....	17,630	7,200	18,865	68.4	....
Kuwait	4	819,000	338,000	54,000	42,000	33,000	170,000	205,000	263,000	....	....	....	5,000	527.0	1,900
Lebanon	2	37,000	12,730	....	7,250	7,492	....	7,392	3,100	....	....	....	409	....	....

Survey of operating refineries worldwide (capacities as of Jan. 1, 1990)

			Charge capacity, b/cd							Production capacity, b/cd					
Country	No. plants	Crude, b/cd	Vacuum distillation	Thermal operations	Catalytic cracking	Catalytic reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Liberia	1	15,000	1,000	....	....	2,000	....	....	3,300	....	....	....	200	....	....
Libya	3	329,400	3,432	....	....	14,182	....	....	37,226	....	....	635	1,716	....	....
Madagascar	1	16,350	1,200	7,000	....	2,600	....	3,600	5,500	....	....	....	....	....	....
Malaysia	4	209,300	11,750	....	....	24,600	....	....	64,850	....	....	....	4,000	....	....
Martinique	1	12,000	....	....	....	3,000	....	....	8,350	....	....	....	....	....	....
Mexico	9	1,514,000	680,700	82,000	267,000	157,800	18,000	250,000	207,000	7,450	10,594	11,500	12,000	70.0	260
Morocco	2	154,600	27,400	....	5,600	26,800	....	....	35,800	....	....	2,100	1,900	....	....
Myanmar	2	32,000	4,000	5,200	....	....	....	....	....	....	500	....	....	....	120
Netherlands	7	1,380,700	404,400	155,060	125,500	178,600	52,000	148,200	545,900	11,500	5,950	11,500	15,500	177.0	....
Netherlands Antilles	1	320,000	158,000	67,000	42,000	15,000	....	....	121,500	5,600	....	8,000	8,000	....	....
New Zealand	1	95,100	41,900	....	....	26,600	23,140	....	59,200	....	....	....	800	44.0	....
Nicaragua	1	14,500	2,000	....	....	2,800	....	....	10,000	....	....	....	800	....	....
Nigeria	4	433,250	124,490	....	82,700	70,070	....	....	109,231	12,144	3,901	3,878	14,850	....	....
Norway	3	295,000	4,000	76,000	41,000	46,000	....	....	104,700	1,800	3,600	....	4,000	....	469
Oman	1	76,932	....	....	....	15,386	....	....	19,506	....	....	....	....	....	....
Pakistan	3	120,275	13,350	....	....	5,100	....	....	33,358	....	504	3,563	3,800	....	....
Panama	1	100,000	14,000	....	....	7,500	....	....	30,000	....	....	....	5,000	....	....
Paraguay	1	7,500	....	....	....	....	....	....	....	....	....	....	....	....	....
Peru	6	172,438	36,915	....	22,540	1,680	....	....	....	....	....	1,080	1,530	....	....
Philippines	4	283,800	70,600	....	23,100	39,900	....	23,000	91,200	4,400	....	3,400	10,000	....	....
Poland	9	385,454	116,082	....	48,705	31,186	....	....	70,658	4,353	12,535	7,433	....	....	....
Portugal	3	313,300	55,300	....	10,100	52,200	10,200	49,800	76,400	....	8,200	3,000	5,800	....	....
Puerto Rico	2	123,000	68,000	....	13,500	26,500	15,000	....	47,800	....	....	....	1000	18.0	....
Qatar	1	62,000	....	....	....	12,030	....	12,000	20,500	....	....	....	....	....	....
Saudi Arabia	7	1,007,000	416,655	34,000	82,400	167,600	78,100	62,900	353,100	18,100	13,900	....	28,500	201.0	....
Senegal	1	24,000	....	....	....	2,600	....	....	2,600	....	....	....	....	....	....
Sierra Leone	1	10,000	....	....	....	....	....	....	....	....	....	....	....	....	....
Singapore	5	830,000	258,000	170,500	....	61,300	49,000	80,600	251,600	....	....	12,800	12,000	79.0	....
Somalia	1	10,000	....	....	....	....	....	....	....	....	....	....	....	....	....
South Africa	4	433,500	104,000	63,500	84,400	62,800	18,000	77,300	142,150	7,000	9,400	3,000	6,140	34.0	....
Spain	10	1,293,000	399,000	174,000	173,300	172,000	15,000	156,100	333,600	1,700	22,020	8,400	42,033	59.2	550
Sri Lanka	1	50,000	2,400	12,500	....	3,750	....	2,100	15,300	....	....	....	1,000	....	....
Sudan	1	25,000	....	....	....	2,100	....	....	9,400	....	....	....	....	....	....
Sweden	5	427,500	135,000	65,000	25,000	72,000	...	65,000	154,500	3,500	4,000	2,500	28,500	1.9	....
Switzerland	2	132,000	24,000	20,000	....	26,000	....	8,000	49,200	....	3,600	....	5,200	....	....
Syria	2	243,744	61,346	36,384	....	28,080	....	26,615	59,955	....	2,850	....	8,490	21.7	530
Taiwan	2	570,000	117,325	14,250	23,750	59,375	19,000	174,800	74,575	3,325	12,210	....	9,258	95.0	800
Tanzania	1	13,500	....	....	....	3,000	....	....	5,000	....	....	....	....	....	....
Thailand	3	214,850	27,800	17,600	15,700	20,750	....	12,550	97,200	....	....	....	4,000	4.7	....
Trinidad	2	300,000	171,000	18,000	28,000	31,000	....	104,500	41,800	2,650	2,800	2,700	2,000	....	....
Tunisia	1	34,000	....	....	....	3,300	....	....	....	....	....	....	....	....	....
Turkey	5	702,560	159,376	4,500	34,128	62,627	....	15,096	153,024	....	....	10,177	23,440	0.4	....
United Kingdom	15	1,253,200	560,590	131,000	321,500	205,400	22,000	41,000	620,390	71,600	36,650	17,200	50,850	....	2,150
Uruguay	1	33,000	13,000	....	4,100	2,500	....	....	3,700	....	....	....	....	....	....
Venezuela	6	1,201,100	560,600	138,000	193,100	6,000	....	296,100	....	61,250	18,300	7,590	39,800	108.9	100
Virgin Islands	1	545,000	215,000	80,000	....	125,000	....	130,000	290,000	....	45,000	....	....	....	....
Yemen, N.	1	10,000	....	....	....	2,500	....	....	....	....	....	....	....	....	....
Yemen, S.	1	161,500	9,500	....	....	10,800	....	2,700	....	....	....	....	2,000	....	....
Yugoslavia	7	609,135	178,759	35,630	52,050	74,612	7,200	21,970	107,878	3,400	18,450	4,900	27,325	14.9	137
Zaire	1	17,000	....	....	....	3,500	....	....	5,000	....	....	....	....	....	....
Zambia	1	24,500	2,400	....	....	5,600	....	....	9,000	....	....	....	60	....	....
Total	**430**	**41,234,203**	**13,712,931**	**3,632,968**	**4,927,008**	**4,827,755**	**1,363,520**	**5,169,613**	**10,967,027**	**502,491**	**611,406**	**372,974**	**1,142,417**	**3,836.55**	**16,715**

WORLDWIDE REFINING	Company and refinery location	Crude	Charge capacity, b/cd							Production capacity, b/cd					
			Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke tons/ day
ABU DHABI	Abu Dhabi National Oil Co.–Ruwais	120,000	46,000	....	....	[2]19,200	[1]27,000	[2]21,900	[2]34,400 [4]20,800	....	....	....	....	[1]53.0	....
	Umm Al-Nar 2	60,000	....	....	....	[4]10,900	....	....	[2]17,500 [4]5,900	....	....	....	....	....	....
	Total	**180,000**	**46,000**	....	....	**30,100**	**27,000**	**21,900**	**78,600**	....	....	....	....	**53.0**	....
ALBANIA	Government-owned refineries at Ballsh, Cerrik, Stalin														
	Total	**40,000**													
ALGERIA	Sonatrach: Arzew	60,000	6,000	....	....	8,600	....	....	8,600	....	....	2,400	2,400	....	....
	Hassi Messaoud	23,700	....	....	....	2,000	....	....	....	....	....	....	....	....	....
	Maison Carree	58,000	....	....	....	15,000	....	....	15,000	....	....	....	....	....	....
	Skikda	323,000	9,000	....	....	30,000	....	....	....	....	1,900	....	2,900	....	....
	Total	**464,700**	**15,000**	....	....	**55,600**	....	....	**23,600**	....	**1,900**	**2,400**	**5,300**	....	....
ANGOLA	Petrangol SARL–Luanda	**32,100**	**1,900**	....	....	**[1]1,900**	....	**[4]2,800**	**[1,2]3,800**	....	....	....	**950**	....	....
ARGENTINA	Destileria Argentina de Petróleo SA–Lomas de Zamora	2,000	1,500	....	....	....	....	....	....	....	....	....	....	....	....
	Esso SAPA–Campana[1]	93,000	51,300	[5]23,500	[1]29,600	[2]8,300	....	....	[2]5,800 [5]10,000	....	....	....	....	....	1,000
	Galvan	18,400	....	[2]7,700	....	....	....	....	....	....	....	....	....	....	....
	Isaura SA–Bahia Blanca	12,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Shell Cia. Argentina de Petróleo SA–Buenos Aires	121,700	54,000	[3]27,000	[1]29,200	[1]12,000	....	....	[2]14,900 [4]7,500	[2]1,700 *500	....	1,500	4,200	....	....
	Yacimientos Petroliferos Fiscales–Campo Duran	32,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Dock Sud	4,000	1,000	....	....	....	....	....	....	....	....	....	....	....	....
	La Plata	216,000	69,500	[5]22,000	[1]45,000	[1]9,000	....	....	[1]9,000 [4]3,000 [6]5,900	[1]1,200 [2]750 *2,700	....	4,150	17,600	....	....
	Lujan de Cuyo	129,000	66,000	[5]30,000	[1]20,900	[1]9,000	[1]23,900	....	[1]4,400	....	....	....	....	[1]19.0	....
	Plaza Huincul	23,000	....	....	....	[2]2,500	....	....	[2]2,500	....	....	....	....	....	....
	San Lorenzo	37,600	16,100	[2]3,500 [3]12,500	....	....	....	....	....	....	....	....	....	....	....
	Total	**688,700**	**259,400**	**125,200**	**124,700**	**40,800**	**23,900**	....	**63,000**	**6,850**	....	**5,650**	**21,800**	**19.0**	**1,000**
	Solvent Extract: [1]3,600 b/cd														
AUSTRALIA	Ampol Refineries Ltd.–Lytton	72,000	....	....	[1]27,500	[1]14,000	....	....	[5]5,000	[1]4,000 *1,100	[6]5,800	....	....	....	....
	Australian Lubricating Oil Refinery Ltd.–Kurnell	....	6,900	....	....	....	....	....	[6]6,300	....	....	3,400	....	....	....
	BP Australia–Brisbane	54,000	15,600	....	[1]17,200	[2]10,500	....	....	[1]10,500 [4]8,000	[2]2,100	....	....	1,000	....	....
	Kwinana	100,000	43,000	....	[1]24,000	[1]6,400 [2]16,400	....	[4]8,200	[1]12,000	[2]2,400	....	2,600	1,700	....	....

WORLDWIDE REFINING	Company and refinery location	Crude	Charge capacity, b/cd							Production capacity, b/cd					Coke
			Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	tons/ day
	Caltex Refining CPL–Kurnell	100,000	16,000	....	^{1}42,000	^{1}24,000	....	....	^{1}24,000 $^{4\text{-}5}$14,400	^{1}3,400 *2,250	....	....	3,000	....	....
	Mobil Oil Australia Ltd.–Adelaide	....	20,000	....	....	....	....	....	....	....	....	4,700	....	....	....
	Petroleum Refineries Australia PL– Adelaide	65,500	....	....	....	^{2}20,000	....	....	^{1}42,500	....	....	....	4,500	....	....
	Altona	98,500	26,600	....	^{2}24,000	^{2}28,000	....	....	^{1}35,000 ^{4}10,000	^{1}2,700	....	....	3,000	....	....
	Shell Refining (Australia) PL.–Clyde	75,000	21,000	....	^{1}35,000	^{2}13,700	....	^{2}7,000	^{4}37,000	^{2}3,000 *800	....	....	3,000	....	....
	Geelong	110,000	9,700	....	^{1}25,000	^{2}11,000 ^{6}20,000	....	^{2}4,000 ^{3}11,000 ^{5}3,500	^{4}55,000	^{2}33,000 *1,000	^{6}7,000	2,500	3,000	....	....
	Total	**675,000**	**158,800**	....	**194,700**	**164,000**	....	**33,700**	**259,700**	**55,750**	**12,800**	**13,200**	**19,200**	....	....
AUSTRIA	OeMV–Schwechat	204,000	68,000	^{3}17,000 ^{6}6,426	^{1}24,000	^{2}14,000 ^{4}18,000	^{4}7,700	^{3}35,000 ^{4}33,000	^{1}37,000 ^{6}1,300 ^{7}11,000	....	^{6}9,000	2,300	5,850	....	....
	Total	**204,000**	**68,000**	**23,426**	**24,000**	**32,000**	**7,700**	**68,000**	**49,300**	....	**9,000**	**2,300**	**5,850**	....	....
BAHRAIN	Bahrain Petroleum Co. BSC (Closed) –Sitra	243,000	156,000	^{3}20,000	^{1}39,000	^{2}18,000	....	^{1}50,000	^{1}18,000 ^{4}22,000	*1,300	....	....	5,000	^{1}32.2	....
	Total	**243,000**	**156,000**	**20,000**	**39,000**	**18,000**	....	**50,000**	**40,000**	**1,300**	....	....	**5,000**	**32.2**	....
BANGLADESH	Eastern Refinery Ltd.–Chittagong	**31,200**	**3,530**	....	....	**^{1}1,650**	....	**^{4}2,430**	**^{2}1,940**	....	....	....	**1,200**	....	....
BARBADOS	Mobil Oil Barbados Ltd.–Bridgetown	**3,000**	....	....	....	....	....	....	....	....	....	....	....	....	....
BELGIUM	Belgian Refining Corp. NV–Antwerp	91,500	45,000	^{3}20,300	....	^{2}12,000	....	$^{1\text{-}2}$22,500 ^{5}25,000	....	....	....	....	....	....	....
	Esso Belgium–Antwerp	239,000	108,600	....	^{1}28,200	^{4}39,200	....	^{2}90,200	^{2}44,400 ^{4}71,200	....	....	....	2,000	^{1}46.0	....
	Nynas Petroleum NV—Antwerp	15,000	12,500	....	....	....	....	....	....	....	....	....	12,000	....	....
	Fina Raffinaderij Antwerpen— Antwerp	306,000	132,200	^{3}42,500	^{1}76,500	^{2}30,200	....	$^{3\text{-}4}$63,400	^{2}67,100	^{2}6,150 *1,560	....	....	11,300	....	....
	Total	**613,500**	**298,300**	**62,800**	**104,700**	**81,400**	....	**201,100**	**182,700**	**7,710**	....	....	**25,300**	**46.0**	....
BOLIVIA	Yacimientos Petroliferos Fiscales Bolivianos–Cochabamba^{1}	39,500	2,961	....	....	^{1}8,500	....	....	^{1}8,500 ^{6}479	....	....	377	....	....	....
	Santa Cruz	15,000	....	....	....	^{2}6,400	....	....	^{1}6,400	....	....	....	....	....	....
	Sucre	3,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Total	**57,500**	**2,961**	....	....	**14,900**	....	....	**15,379**	....	....	**377**	....	....	....
	^{1}Solvent extraction: 166 b/cd.														
BRAZIL	Petróleo Brasileiro SA: Araucária, Paraná^{1}	144,800	66,300	....	^{1}42,300	....	....	....	....	....	....	....	7,600	....	....
	Betim, Minas Gerais	144,700	72,300	....	^{1}32,100	....	....	....	^{2}10,200 ^{5}25,000	....	....	....	1000	^{2}5.0	....
	Canoas, Rio Grande do Sul	72,400	35,000	....	^{1}13,700	....	....	....	....	....	....	....	1,100	....	....

			Charge capacity, b/cd							Production capacity, b/cd					
	Company and refinery location	**Crude**	**Vacuum distillation**	**Thermal operations**	**Catalytic cracking**	**Cat reforming**	**Cat hydro-cracking**	**Cat hydro-refining**	**Cat hydro-treating**	**Alky. *Poly.**	**Aromatics/ isomerization**	**Lubes**	**Asphalt**	**Hydrogen, MMcfd**	**Coke tons/day**
	Cubatão, São Paulo	175,000	120,100	[5]29,600	[1]50,600	[1]10,500	....	....	....	[2]4,300	[1]2,650	....	1,800	....	1,267
	Duque de Caxias, Rio de Janeiro[2]	229,000	116,600	....	[1]50,600	[1]10,500	....	....	[6]15,400 [7]850	....	....	12,500	4,300	[1]5.0	....
	Fortaleza, Ceará	....	4,200	....	....	....	....	....	....	....	....	....	2,500	....	....
	Manaus, Amazonas	8,500	5,400	....	[1]1,900	....	....	....	....	....	....	....	550	....	....
	Mataripe, Bahia[3]	126,900	79,600	....	[1]25,000	....	....	....	[6]3,400 [7]2,500	....	....	3,500	1,700	[1]1.1	....
	Mauá, Santo André, São Paulo	30,200	10,200	....	[2]17,300	....	....	....	....	*4,400	....	....	....	....	....
	Paulínia, São Paulo	289,500	144,800	....	[1]41,600	....	....	....	....	....	....	....	5,900	....	....
	São José dos Campos, São Paulo	156,800	90,500	....	[1]53,500	....	....	....	[2]18,200 [4]59,700	....	....	....	7,500	[2]9.0	....
	Refinaria de Petróleo Ipiranga SA–Rio Grande do Sul	9,300	4,100	....	[1]2,500	....	....	....	....	....	....	....	....	....	....
	Refinaría de Petroleos de Manguinhos SA–Rio de Janeiro	10,000	....	[2]4,300 [3]4,400	....	....	....	....	....	....	....	....	....	....	....
	Total	**1,397,100**	**749,100**	**38,300**	**331,100**	**21,000**	....	....	**135,250**	**8,700**	**2,650**	**16,000**	**33,950**	**20.1**	**1,267**
BRUNEI	Brunei Shell Petroleum CL–Seria	**10,000**	....	....	....	....	....	....	....	....	....	....	....	....	....
BULGARIA	Government-owned refineries at Burgas, Pleven, Ruse.														
	Total	**300,000**													
CAMEROON	Sonara–National Refining CL–Cape Limboh, Limbe	**43,020**	....	....	....	**[2]6,920**	....	**[5]10,700**	**[1]9,680**	....	....	....	....	....	....
CANADA **Alberta**	Husky Oil Operations Ltd.–Lloydminster	25,000	11,750	....	....	....	....	....	....	....	....	....	11,750	....	....
	Imperial Oil Ltd.–Edmonton	164,900	66,100	....	[1]47,000	[4]20,900	....	[4]15,000	[2]51,000	[2]12,200	[4]6,700	3,200	5,800	....	....
	Parkland Refining Ltd.–Bowden	6,000	....	....	....	[1]3,000	....	....	[2]3,000	....	[4-6]3,000	....	....	....	....
	Petro-Canada Products Inc.–Edmonton	115,500	27,000	[5]7,100	[1]33,300	[2]12,600	[4]18,200	....	[5]7,300 [7]46,600	[2]9,500	[4]3,000	....	....	[1]30.8	431
	Shell Canada Ltd.–Scotford	59,800	....	....	....	[6]21,500	[1]40,500	....	[2]21,550 [4]21,000	....	[1-2]5,300 [3]270	....	....	[1]62.0	....
	Turbo Resources Ltd.–Balzac	27,500	6,950	....	[1]11,570	[2]7,550	....	....	[2]10,410 [4]7,550 [7]13,300	*1,035	....	....	....	....	....
	Total	**398,700**	**111,800**	**7,100**	**91,870**	**65,550**	**58,700**	**15,000**	**181,710**	**22,735**	**18,270**	**3,200**	**17,550**	**92.8**	**431**
British Columbia	Chevron Canada Ltd.–North Burnaby	36,000	9,400	....	[1]10,500	[1]10,000	....	....	[1]10,000	[1]2,000 *600	....	....	2,500	....	....
	Husky Oil Operations Ltd.–Prince George	9,600	3,000	....	[1]2,900	[2]1,250	....	....	[1-2-4-5]7,000	....	....	....	....	....	....
	Imperial Oil Ltd.–Ioco	42,800	20,900	....	[1]12,300	[3]6,700	....	....	[2]6,700 [4]5,700 [5]5,700	*1,200	....	....	700	....	....
	Petro-Canada Products Inc.–Port Moody	25,500	....	....	....	[2]8,600	....	....	[1]15,400 [4]14,100	....	....	....	....	....	....

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[1]Solvent extraction: 27,800 b/cd. [2]30,200 b/cd. [3]3,400 b/cd.

	Company and refinery location	Crude	Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke tons/ day
				Charge capacity, b/cd						Production capacity, b/cd					
	Taylor	17,400	1,600		^{1}6,300	^{2}3,000	....	....	^{1}4,000 ^{4}7,200	^{2}1,000	....	....	500	....	....
	Shell Canada Ltd.–Shellburn, Burnaby	24,000	7,000	[illegible]	^{1}5,600	^{2}3,600	....	....	^{2}5,400 ^{4}9,900	*720	....	....	2,250	....	....
	Total	**155,300**	**41,900**	....	**37,600**	**33,150**	....	....	**91,100**	**5,520**	....	....	**5,950**	....	....
New Brunswick	Irving Oil Ltd.–St. John	237,500	61,750	^{3}18,000	^{1}17,100	^{2}34,650	^{1}29,700	....	^{1}45,450 ^{4}40,500	*1,710	^{6}9,500	....	11,700	^{2}40.0	....
	Total	**237,500**	**61,750**	**18,000**	**17,100**	**34,650**	**29,700**	....	**85,950**	**1,710**	**9,500**	....	**11,700**	**40.0**	....
Newfoundland	Newfoundland Processing Ltd.–Come By Chance	100,000	51,000	....	....	^{4}25,000	^{1}32,000	....	....	....	....	....	....	....	....
	Total	**100,000**	**51,000**	....	....	**25,000**	**32,000**	....	....	....	....	....	....	....	....
Northwest Territories	Imperial Oil Ltd.–Norman Wells	**3,500**	....	....	....	....	....	....	....	....	....	....	....	....	....
Nova Scotia	Imperial Oil Ltd.–Dartmouth	82,300	39,800	....	^{1}23,000	^{4}8,600	....	....	^{1}8,600 ^{4}25,700 ^{5}8,600	*2,600	....	....	4,200	^{1}1.7	....
	McColl Frontenac Inc.–Halifax	20,000	8,600	....	^{1}7,200	^{2}3,600	....	^{4}5,200	^{1}3,600	....	....	....	....	....	....
	Total	**102,300**	**48,400**	....	**30,200**	**12,200**	....	**5,200**	**46,500**	**2,600**	....	....	**4,200**	**1.7**	....
Ontario	Imperial Oil Ltd.–Sarnia	122,600	28,500	^{4}21,000	^{1}23,500	^{2}13,300 ^{4}14,300	^{1}10,400	....	^{2}32,300 ^{4}13,300 ^{5}24,700	^{2}6,800 *4,200	....	6,200	....	^{1}21.8	....
	Petro-Canada Products Inc.–Clarkson	41,500	35,500	....	....	^{6}9,800	^{3}10,300	....	^{1}10,300 ^{4}5,900	....	....	4,900	4,600	^{1}13.3	....
	Oakville	80,500	41,000	....	^{1}25,400	^{1}5,000 ^{2}11,500	....	....	^{1}19,500 ^{4}6,300	^{1}3,100	....	....	9,500	....	....
	Shell Canada Ltd.–Sarnia	71,000	24,700	^{3}4,050	^{1}14,400	^{2}21,000	^{1}6,750	....	^{1}15,000 ^{5}6,300	*1,600	^{1}2,700	....	....	....	....
	Suncor Inc.–Sarnia	70,000	15,000	^{3}5,200	^{2}16,000	^{2}26,000	^{2}18,600	^{4}3,700	^{1}25,600	^{2}4,100	^{1}7,400	....	....	^{1}38.0	....
	McColl Frontenac Inc.–Nanticoke	95,000	31,000	....	^{1}40,000	^{6}24,000	....	....	^{1}24,000	^{1}7,400	....	....	....	....	....
	Total	**480,600**	**175,700**	**30,250**	**119,300**	**124,900**	**46,050**	**3,700**	**183,200**	**27,200**	**10,100**	**11,100**	**14,100**	**73.1**	....
Quebec	Petro-Canada Products Inc.–Montreal	87,400	40,700	^{3}12,600	^{1}17,200	^{2}31,300	^{4}14,400	....	^{1}26,600 ^{4}9,000	^{1}2,300 *800	^{1}8,700 ^{2}2,800	....	14,300	^{1}42.8	....
	Shell Canada Ltd.–Montreal	120,000	49,400	^{3}12,000	^{1}22,000	^{2}20,700	^{1}11,700	....	^{2}34,200 ^{4}27,000	^{2}2,500	^{6}6,800	3,060	7,200	....	....
	Ultramar Canada Inc.–St. Romuald	103,000	33,000	....	^{1}34,600	^{2}15,000	....	....	^{1}15,000 ^{4}15,000	*3,900	....	....	30,000	....	....
	Total	**310,400**	**123,100**	**24,600**	**73,800**	**67,000**	**26,100**	....	**126,800**	**9,500**	**18,300**	**3,060**	**51,500**	**42.8**	....
Saskatchewan	Consumers' Cooperative Refineries Ltd.–Regina	45,200	23,000	^{5}8,300	^{1}17,600	^{2}9,000	^{1}10,800	^{1}27,100	^{1}10,800 ^{2}2,700 ^{5}6,300	*1,880	^{6}2,700	....	....	^{1}58.8	325

WORLDWIDE REFINING	Company and refinery location	Crude	Charge capacity, b/cd							Production capacity, b/cd					
			Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke tons/ day
	Producers Pipeline–Moose Jaw	13,300	7,300	....	....	....	....	....	....	....	....	....	5,500	....	....
	Total	**58,500**	**30,300**	**8,300**	**17,600**	**9,000**	**10,800**	**27,100**	**19,800**	**1,880**	**2,700**	....	**5,500**	**58.8**	**325**
	Total Canada	**1,851,800**	**642,950**	**88,250**	**387,470**	**372 450**	**206,350**	**51,000**	**735,060**	**71,145**	**58,870**	**17,360**	**110,500**	**309.2**	**756**
CHILE	ENAP–Gregorio-Magallanes	8,800	....	....	....	....	....	....	....	....	....	....	....	....	....
	Petrox SA–Talcahuano	72,000	35,600	^{3}10,000	^{1}18,870	^{2}4,000	....	....	....	....	....	....	100	....	....
	Refineria de Concón–Concón	66,000	39,000	^{3}10,000	^{1}20,000	^{1}6,000	....	....	^{2}6,000	^{1}1,000	....	....	1,000	....	....
	Total	**146,800**	**74,600**	**20,000**	**38,870**	**10,000**	....	....	**6,000**	**1,000**	....	....	**1,100**	....	....
CHINA	Government-owned refineries at Anshan, Beijing, Dalian, Daqing, Fushun, Hangzhou, Jinxi, Karamai-Dushanzi, Lanchow, Lenghu, Maoming, Nanchong, Nanjing, Shanghai, Shengli, Tianjin, Yumen.														
	Total	**2,200,000**													
COLOMBIA	Empresa Colombiana de Petróleos –Barrancabermeja-Santander[1]	150,000	80,000	^{3}40,000	^{1}62,000	^{2}6,000	....	....	^{1}6,000 ^{3}540 ^{5}22,000 ^{6}4,300 ^{7}1,400	^{1}3,000 ^{2}500 *2,000	^{1}3,300 ^{2}1,100 ^{3}700	2,300	2,400	^{1}21.0	....
	Cartagena, Bolivar	70,000	40,000	^{3}20,000	^{1}29,000	....	....	....	....	*5,800	....	....	....	....	....
	Orito, Putumayo	2,400	....	....	....	....	....	....	....	....	....	....	....	....	....
	Tibu, N. de Santander	5,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Total	**227,400**	**120,000**	**60,000**	**91,000**	**6,000**	....	....	**34,240**	**11,300**	**5,100**	**2,300**	**2,400**	**21.0**	....
	Solvent extraction: ^{1}35,000 b/cd.														
CONGO	Coraf–Pointe-Noire	**21,000**	**8,000**	....	....	**^{2}2,000**	**^{1}2,000**	....	**^{4}3,500**	....	....	....	....	....	....
COSTA RICA	Refinadora Costarricense de Petroleo SA–Limón	16,200	600	^{2}6,500	....	^{2}1,200	....	....	^{1}1,200 ^{4}2,200	....	....	....	300	....	....
	Total	**16,200**	**600**	**6,500**	....	**1,200**	....	....	**3,400**	....	....	....	**300**	....	....
CUBA	Government-owned refineries at Cabaiguan, Cienfuegos, Havana, Santiago de Cuba.														
	Total	**280,000**													
CYPRUS	Cyprus Petroleum Refinery Ltd – Larnaca	**18,000**	**2,600**	....	....	**^{2}4,300**	....	....	**^{4}7,750**	....	....	....	**1,200**	....	....
CZECHO-SLOVAKIA	Government owned refineries at Bratislava, Kolin, Kralupi, Pardubice, Strazke, Zaluzi, Zyolen.														
	Total	**455,000**													
DENMARK	AS Dansk Shell–Fredericia	65,000	....	^{2}25,000	....	^{2}12,000	....	^{2}13,000	^{2}21,000	....	^{6}4,000	....	....	....	....
	Statoil AS–Kalundborg	65,000	22,000	^{3}28,000	....	^{2}8,600	....	....	^{1}8,600 ^{5}11,400	....	....	....	8,000	....	....
	Kuwait Petroleum Refining (Danmark) A/S–Gulfhavn	56,500	19,050	^{2}10,900 ^{3}9,770	....	^{2}10,500	....	....	^{2}22,300 ^{4,5}22,900	....	....	....	....	....	....
	Total	**186,500**	**41,050**	**73,670**	....	**31,100**	....	**13,000**	**86,200**	....	**4,000**	....	**8,000**	....	....

			Charge capacity, b/cd							Production capacity, b/cd					Coke
WORLDWIDE REFINING	Company and refinery location	Crude	Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	tons/ day
DOMINICAN REPUBLIC	Falconbridge Dominicana C por A–La Bonao	16,000	....	....	....	....	....	....	[2]6,200	....	....	....	....	[2]0.8	....
	Refineria Dominicana de Petróleo SA–Haina	32,500	....	....	....	[1]9,000	....	....	[4]17,500	....	....	....	....	....	....
	Total	**48,500**	....	....	....	**9,000**	....	....	**23,700**	....	....	....	....	**0.8**	....
ECUADOR	CEPE–Esmeraldas	90,000	40,025	[3]21,126	[1]16,000	[2]2,800	....	....	....	....	....	....	....	....	....
	Sta. Elena Peninsula	36,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Refieria Amazonas	10,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Repetrol–Santa Elena	8,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Texaco–Lago-Agrio	1,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Total	**145,000**	**40,025**	**21,126**	**16,000**	**2,800**	....	....	....	....	....	....	....	....	....
EGYPT	Alexandria Petroleum Co.–Alexandria (El-Mex)	99,250	22,500	....	....	....	....	....	[6]1,436 [7]76	....	603 281	1,436	2,010	[1]1.0	1
	Cairo Oil Refining Co.–Mostorod	125,060	....	....	....	[2]9,000	....	....	[1]11,700 [4]14,400	....	....	....	....	....	....
	Tanta	21,800	....	....	....	....	....	....	....	....	....	....	....	....	....
	El Ameria Oil Refining Co.–Alexandria	60,340	14,725	....	....	[2]9,400	....	....	[1]12,000 [4]14,400 [6]1,608	[2]804	[1]86 [1]482	1,407	2,010	[1]1.0	....
	El-Nasr Petroleum Co.–El-Suez	58,400	....	....	....	....	....	....	....	....	....	....	2,613	....	....
	Wadi-Feran	9,680	....	....	....	....	....	....	....	....	....	....	....	....	....
	Suez Oil Processing Co.–El-Suez	62,530	9,500	[5]16,470	....	[2]12,540	....	....	[1]16,660 [4]10,800 [6]1,306	....	....	1,005	....	[5]3.5	540
	Assiout	52,143	....	....	....	....	....	....	....	....	....	....	....	....	....
	Total	**489,203**	**46,725**	**16,470**	....	**30,940**	....	....	**84,386**	**804**	**1,452**	**3,848**	**6,633**	**5.5**	**541**
El SALVADOR	Refineria Petrólera Acajutla SA–Acajutla	17,000	1,200	....	....	[1]3,200	....	....	[2]5,000 [4]7,000	....	....	....	....	....	....
	Total	**17,000**	**1,200**	....	....	**3,200**	....	....	**12,000**	....	....	....	....	....	....
ETHIOPIA	Ethiopian Petroleum Corp.–Assab	**18,000**	**1,600**	....	....	[2]**2,270**	....	....	....	....	....	....	....	....	....
FINLAND	Neste Oy–Naantali	44,000	13,700	[3]7,100	[2]13,300	[5]6,800	....	[3]7,100 [4]14,700	[2]6,600 [7]330	*280	....	....	3,000	....	....
	Porvoo	197,000	67,700	[3]39,200	[1]28,500	[5]36,100	[1]14,200	[4]82,700	[2]51,000	[2]4,200 *3,500	[5]3,600	....	8,800	[1]20.0	....
	Total	**241,000**	**81,400**	**46,300**	**41,800**	**42,900**	**14,200**	**104,500**	**57,930**	**7,980**	**3,600**	....	**11,800**	**20.0**	....
FRANCE	CRD—Total France–Gonfreville L'Orcher[1]	309,000	73,000	[3]16,600	[1]31,500	[2]45,400	....	[3]59,600 [5]9,000	[1]27,100 [2]71,600	*1,150	[1]1,360	7,400	20,250	....	....
	La Mède	136,000	47,500	[3]20,850	[1]29,700	[4]23,400	....	[3]49,100 [5]10,400	....	[2]2,400	....	....	16,200	....	....
	Mardyck	122,000	41,600	....	[1]29,800	[4]20,500	....	[3]24,500	[2]37,500	....	....	....	....	....	....
	Cie. Rhénane de Raffinage–Reichstett-Vendenheim	80,000	36,000	[2]5,000 [3]11,000	[1]14,000	[2]13,000	....	[2]17,000	[2]25,000	....	....	....	8,000	....	....

	Company and refinery location	Crude	Charge capacity, b/cd							Production capacity, b/cd					Coke
			Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	tons/ day
	Elf France–Donges	200,000	99,000	[3]30,800	[1]66,000	[2]25,600	....	....	[1]35,600 [4]39,600	[2]3,700	[6]6,300	....	....	....	....
	Feyzin	120,000	36,000	[3]15,900	[1]22,700	[2]8,600	....	....	[1]8,700 [4]28,900	....	[1]5,000	....	....	....	....
	Grandpuits	92,000	46,900	[3]16,000	[1]28,800	[2]12,900	....	....	[1]23,500 [4]26,100	[2]2,900	....	....	....	....	....
	Esso SAF–Fos sur Mer	100,000	30,000	....	[1]22,000	[1]16,000	....	....	[4]48,000	....	....	....	....	....	....
	Port Jerome	136,000	56,000	....	[1]24,000	[1]16,000	....	....	[4]36,000	....	....	7,000	....	....	....
	Mobil Oil Francaise–Notre Dame de Gravenchon	57,000	36,500	....	....	[2]13,300	....	....	[1]13,000 [4]13,000	....	[6]9,000	5,500	1,500	....	....
	Shell Francaise–Berre l'Etang	128,000	50,000	[3]23,000	[1]38,000	[2]19,000	....	[2]35,000	[2]33,000	....	....	....	5,500	....	....
	Petit Couronne	158,000	90,000	[3]12,000	[1]20,000	[2]28,000	....	[2]33,000	[2]48,000	....	....	7,500	9,000	....	....
	Ste. Francaise des Petroles BP–Dunkirk	....	18,000	....	....	....	....	....	....	....	....	4,200	....	....	....
	Lavera	181,900	....	[3]22,800	[1]26,000	[1]5,700	[1]13,500	[4]32,300	[5]14,000	....	[1]4,300	....	2,700	[1]28.0	....
	Total	**1,819,900**	**660,500**	**152,850**	**325,500**	**247,400**	**13,500**	**289,900**	**514,600**	**10,150**	**25,960**	**31,600**	**59,650**	**28.0**	....
GABON	Ste. Gabonaise de Raffinage–Port Gentil	**24,000**	....	**[2]7,200**	....	**[3]1,400**	....	....	**[4]3,600**	....	....	....	....	....	....
GERMANY, EAST	Government-owned	**470,000**													
	Veb Petrolchemisches Kombinat 4 Refineries	325,000	142,000 [6]13,000	[3]28,500	[1]36,000 [4]16,500	[2]26,000	....	[3]40,000 [5]65,000	[1]50,000	[2]5,200 [2]4,100	[1]8,700	8,700	9,500	....	100
	Total	**795,000**	**142,000**	**41,500**	**36,000**	**42,500**	....	**40,000**	**115,000**	**5,200**	**12,800**	**8,700**	**9,500**	....	**100**
GERMANY, WEST	BP Oiltech Gmbh	....	185,000	....	....	....	....	....	[7]800	....	....	4,200	....	[5]327.0	....
	DEA Mineraloel AG–Heide	80,000	30,000	[3]14,000	[1]9,000	[4]20,000	....	[3]11,000 [4]18,000	[1]25,000	*450	[1]5,000	....	5,000	....	....
	UK-Wesseling	90,000	50,000	[3]26,000	....	[4]19,000	[1]40,000	[4]14,000	[1]24,000	*2,000	[1]7,000	....	....	....	
	Deutsche BP-Erdol Ingolstadt-Vohburg†	102,000	35,300	....	[1]17,200	[1]17,200	....	[4]14,000	[4]28,000	....	....	....	5,500	....	....
	DMP Mineralol Petrochemie GmbH–Burghausen	72,000	....	[5]27,500 [6]5,462	....	....	....	....	[5]18,700	....	[2]2,340	....	....	....	685
	Deutsche Shell AG–Godorf	170,000	73,000	[2]18,000 [3]7,000	....	[2]17,000 [6]21,000	[1]19,000	[2]32,000	[2]52,000 [3]34,000 [4]12,000	....	[1]14,000 [2]3,000 [6]6,000	....	12,000	....	....
	Harburg-Grasbrook	86,000	45,000	[3]14,000	[1]15,000	[6]16,000	....	[2]14,000 [5]6,000	[2]31,000 [3]2,000	....	....	6,100	7,000	....	....
	Erdoel Raffinerie Neustadt GmbH–Neustadt-Donau	144,000	65,400	[3]13,000	[1]26,000	[1]17,700	....	[4]27,200	[1]22,500	....	....	....	5,400	....	....
	Esso AG–Ingolstadt	95,000	31,400	....	[1]24,500	[2]12,800	....	[4]46,000	[4]46,000	....	....	....	7,400	....	....
	Karlsruhe	150,000	46,700	[2]28,000 [3]23,000 [5]17,000	....	[2]27,900	....	[4]73,000	[2]43,000	....	....	....	10,000	....	1,000
	Mobil Oil AG–Woerth	93,000	23,000	....	[1]19,000	[2]15,900	....	....	[1]28,000 [5]26,000	....	[6]5,500	....	5,000	....	....
	Oberrheinische Mineraloiwerke GmbH–Karlsruhe	142,000	102,000	[3]31,000	[1]66,000	[2]11,400 [6]21,300	....	[3]66,000 [4]30,000	[1]37,400	[2]10,200	....	....	11,800	....	....

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[1] Solvent extraction: 9,800 b/cd.

WORLDWIDE REFINING	Company and refinery location	Crude	Charge capacity, b/cd							Production capacity, b/cd					Coke
			Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	tons/ day
	Ruhr Oel GmbH–Gelsenkirchen	215,400	48,200	^{3}16,000 ^{5}28,000	^{1}6,000	^{1}11,900 ^{5}27,000	^{1}30,000	^{4}63,000	^{1}53,000	....	^{1}10,620 ^{2}2,150 ^{3}2,420	....	6,000	^{5}25.0	1,200
	Wintershall AG–Lingen	65,000	31,700	^{5}15,300	....	^{2}12,200 ^{4}15,000	^{1}19,200	^{4}21,300	^{1}15,000 ^{2}2,500	....	^{1}500 ^{2}900 ^{3}2,200	....	3,400	^{1}40.0	420
	Salzbergen	2,800	4,800	....	....	....	....	....	^{6}2,500	....	....	2,900	....	^{1}0.5	....
	Total	**1,507,200**	**771,500**	**283,262**	**182,700**	**283,300**	**108,200**	**435,500**	**503,400**	**12,650**	**61,630**	**13,200**	**78,500**	**392.5**	**3,305**
GHANA	Ghanaian Italian Petroleum CL–Tema	**26,600**	....	....	....	**^{2}5,850**	....	....	**^{1}5,850**	....	....	....	....	....	....
GREECE	Hellenic Aspropyrgos Refinery SA–Aspropyrgos	110,000	51,000	^{3}21,600	^{1}23,300	^{2}9,500 ^{6}20,000	....	^{2}15,600 ^{3}25,500	^{2}24,200	*1,300	^{6}7,000	....	....	^{5}9.1	....
	Motor Oil (Hellas) Corinth Refineries SA–Aghii Theodori	100,000	59,000	^{3}19,520	^{1}27,200	^{1}8,500	....	^{2}25,800	^{1}11,700 ^{2}25,800 ^{6}3,000	^{2}2,400 *2,000	^{6}4,500	3,500	2,800	^{1}3.4	....
	Petrola Hellas SA–Elefsis	108,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Thessaloniki Refining Co. AE–Thessaloniki	66,500	8,100	....	....	^{2}8,100	....	....	^{2}16,500 ^{4}18,800	....	....	....	2,800	....	....
	Total	**384,500**	**118,100**	**41,120**	**50,500**	**51,300**	....	**66,900**	**100,200**	**5,700**	**11,500**	**3,500**	**5,600**	**12.5**	....
GUATEMALA	Texas Petroleum Co.–Escuintla	16,000	....	....	....	^{2}3,000	....	....	^{1}3,000 ^{4}2,000	....	....	....	....	....	....
	Total	**16,000**	....	....	....	**3,000**	....	....	**5,000**	....	....	....	....	....	....
HONDURAS	Refineria Texas de Honduras SA–Puerto Cortes	14,000	....	....	....	^{1}1,800	....	....	^{1}3,000 ^{4}2,000	....	....	....	....	....	....
	Total	**14,000**	....	....	....	**1,800**	....	....	**5,000**	....	....	....	....	....	....
HUNGARY	Dunai KV–Százhalombatta	150,000	84,000	^{3}13,300	^{1}20,000	^{2}23,000	....	....	^{1}23,000 ^{4}35,000 ^{6}2,200	^{2}3,300	^{1}7,100 ^{6}2,700	4,000	6,300	....	....
	Tiszai KV–Leninváros	60,000	30,000	....	....	....	....	....	^{4}16,400	....	....	....	....	....	....
	Zalai KV–Zalaegerszeg	10,000	6,000	....	....	....	....	....	....	....	....	....	4,500	....	....
	Total	**220,000**	**120,000**	**13,300**	**20,000**	**23,000**	....	....	**76,600**	**3,300**	**9,800**	**4,000**	**10,800**	....	....
INDIA	Bharat Petroleum CL–Mahul, Bombay	156,600	42,500	....	^{1}33,800	^{1}5,400	....	....	....	....	^{1}2,500 ^{1}375	....	1,000	....	....
	Bongaigaon Refinery & Petrochemicals Ltd.–Bongaigaon, Assam	27,392	....	^{5}10,400	....	^{2}1,930	....	....	^{1}1,930	....	....	....	....	....	166
	Cochin Refineries Ltd.–Ambalamugal	90,000	34,200	^{3}19,600	^{1}20,000	^{1}5,000	....	....	^{2}9,400 ^{7}18,000	....	....	....	6,900	....	....
	Hindustan Petroleum CL–Mahul, Bombay†	111,650	52,500	....	^{1}12,000	....	....	....	^{6}6,600	....	....	4,800	9,400	86.25	....
	Visakhapatnam	90,000	43,200	....	^{1}19,200	....	....	....	....	....	....	....	2,440	....	....

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†Operating on a semi-integrated basis.

WORLDWIDE REFINING	Company and refinery location	Crude	Charge capacity, b/cd							Production capacity, b/cd					
			Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke tons/ day
	Indian Oil CL–Barauni	66,000	15,000	^{5}20,170	....	....	....	....	....	....	....	....	....	....	525
	Digboi	10,050	....	^{5}800	....	....	....	....	....	....	....	1,200	513	....	40
	Guwahati	16,400	....	^{5}5,500	....	....	....	....	....	....	....	....	....	....	150
	Gujarat	192,050	47,000	^{3}18,900	^{1}19,800	^{1}7,000	....	....	....	....	^{1}1,375	....	4,300	....	....
	Haldia	55,000	20,000	^{3}8,500	....	^{1}4,500	....	^{4}13,800	^{6}3,800	....	....	3,800	3,500	....	....
	Mathura	150,000	43,000	^{3}18,900	^{1}19,800	....	....	....	....	....	....	....	8,600	....	....
	Madras Refineries Ltd.–Madras	114,700	36,800	^{2}4,900 ^{3}3,000	^{1}11,770	^{1}2,400	....	....	^{1}2,400 ^{4}25,100 ^{6}4,000	....	....	4,000	3,800	^{1}9.5	....
	Total	**1,079,842**	**334,200**	**110,670**	**136,370**	**26,230**	....	**13,800**	**71,231**	....	**4,250**	**13,800**	**40,453**	**95.75**	**881**

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[1]Solvent extraction: 10,000 b/cd.

WORLDWIDE REFINING	Company and refinery location	Crude	Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke tons/ day
INDONESIA	Pertamina–Balikpapan, Kalimantan	221,500	84,800	....	....	^{6}18,000	^{1}49,700	....	^{1}18,000	....	....	....	....	^{1}60.0	....
	Cilacap, Central Java	271,200	30,700	^{3}49,900	....	^{1}12,000 ^{6}18,000	....	^{4}18,000	^{1}18,100	....	....	5,000	7,500	....	....
	Dumai, Central Sumatra	99,400	83,500	^{5}31,800	....	^{1}5,600 ^{6}7,900	^{1}50,400	....	^{1}6,300 ^{3}9,100	....	....	....	....	^{1}78.8	....
	Musi, South Sumatra	81,400	30,000	....	^{1}12,600	....	....	....	....	^{1}300 *300	....	....	....	....	....
	Pangakalan Brandan, North Sumatra	4,500	....	....	....	....	....	....	....	....	....	....	....	....	....
	Sungai Pakning, Central Sumatra	36,200	....	....	....	....	....	....	....	....	....	....	....	....	....
	Total	**714,200**	**227,000**	**81,700**	**12,600**	**61,500**	**100,100**	**18,000**	**51,500**	**600**	....	**5,000**	**7,500**	**138.8**	....
IRAN	National Iranian Oil Co.–Esfahan	200,000	96,800	^{3}38,000	....	29,600	^{1}30,000	....	29,000	....	....	....	5,450	70.0	....
	Shiraz	40,000	18,400	^{3}8,800	....	6,245	^{1}9,380	3,120	5,225	....	....	....	....	....	....
	Tabriz	80,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Tehran	210,000	100,000	^{3}34,000	....	28,000	^{1}26,000 ^{2}27,800	....	....	....	....	6,000	7,000	....	....
	Total	**530,000**	**215,200**	**80,800**	....	**63,845**	**93,180**	**3,120**	**34,225**	....	....	**6,000**	**12,450**	**70.0**	....

Note: Present status uncertain due to Iran-Iraq war.

WORLDWIDE REFINING	Company and refinery location	Crude	Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke tons/ day
IRAQ	Oil Refineries Administration–Baiji	150,000	65,000	....	....	22,000 16,500	38,000	31,000 28,000 41,000	....	....	....	....	....	64.0	....
	Basra	70,000	17,650	....	....	....	....	....	....	....	....	2,008	....	....	....
	Daura	71,000	....	....	....	5,000	....	....	13,000	....	....	8,160	1,815	....	....
	K3-Haditha	7,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Khanaqin	12,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Mufthia	4,500	....	....	....	....	....	....	....	....	....	....	....	....	....
	Qaiyarah, Mosul	2,000	....	....	....	....	....	....	....	....	....	....	4,900	....	....
	Iraqi Company for Oil Operations–Kirkuk	2,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Total	**318,500**	**82,650**	....	....	**43,500**	**38,000**	**100,000**	**13,000**	....	....	**10,168**	**6,715**	**64.0**	....

Note: Present status uncertain due to Iran-Iraq war.

WORLDWIDE REFINING	Company and refinery location	Crude	Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke tons/ day
IRELAND	Irish Refining plc–Whitegate	**56,000**	....	....	....	**^{4}11,000**	....	**^{4}5,500**	**^{2}11,000**	....	....	....	....	....	....

WORLDWIDE REFINING	Company and refinery location	Crude	Charge capacity, b/cd Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Production capacity, b/cd Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke tons/ day
ISRAEL	Oil Refineries Ltd.-Ashdod	70,000	40,000	^{2}7,000 ^{3}20,000	....	^{2}11,000	....	^{4}28,000	^{2}17,000	....	....	....	....	....	....
	Haifa	110,000	55,000	^{3}40,000	^{1}24,000	^{2}15,000	....	^{4}20,000	^{1}15,000	....	....	....	3,000	....	....
	Total	**180,000**	**95,000**	**67,000**	**24,000**	**26,000**	....	**48,000**	**32,000**	....	....	....	**3,000**	....	....
ITALY	Agip Plus SpA-Livorno	100,000	36,000	....	....	^{2}9,500 ^{4}9,000	....	^{4}31,700	^{1}20,000	....	....	8,800	3,500	....	....
	Agip Raffinazione SpA-Porto Marghera	90,000	11,000	^{6}25,000	....	^{2}11,000	....	^{4}20,000	^{2}11,000	....	^{5}6,000	....	7,400	....	....
	Rho, Milan	79,800	32,800	....	^{2}14,300	^{2}17,000	....	^{4}15,400	^{2}20,700	^{2}1,600	....	1,410	4,100	^{5}14.3	....
	Sannazzaro, Pavia	210,000	64,500	^{3}28,000	^{1}27,000	^{2}10,000 ^{5}16,700	....	^{4}41,000	^{1}9,800 ^{2}27,000	^{2}3,200	^{5}11,000	....	....	^{5}2.8	....
	Taranto	83,300	13,500	^{2}18,150 ^{3}37,250	....	^{2}17,000	....	^{4}13,700 ^{5}20,500	^{2}24,000	....	....	....	....	^{2}10.0	....
	Venezia	90,000	38,000	^{3}25,000	....	^{2}16,000	....	^{4}18,000	^{1}16,000 ^{2}5,200 ^{3}4,000	....	^{5}5,200	....	6,500	....	....
	Anonima Petroli Italiana-Falconara, Marittima	78,900	13,000	^{2}4,500 ^{3}31,000	....	^{2}10,500	....	....	^{1}18,900 ^{4}26,900	....	....	....	....	^{5}3.8	....
	Arcola Petrolifera SpA-La Spezia	18,000	8,000	....	....	....	....	....	....	....	....	....	....	....	....
	Esso Italiana SpA-Augusta, Siracusa	180,000	94,000	....	^{1}45,300	^{2}22,300	....	....	^{1}22,300 ^{6}23,000	^{2}9,100	^{4}5,300	16,900	11,500	....	....
	Industrie Chimiche Italiane de Petrolio SpA-Frassino, Mantova	55,000	19,600	^{2}8,000 ^{3}19,000	....	^{2}7,000	....	....	^{2}14,000 ^{4}15,000	....	^{6}2,500	....	3,000	....	....
	Iplom SpA-Busalla	46,500	12,600	^{3}13,100	....	....	....	....	....	....	....	6,500	12,500	....	....
	Isab-Priolo Gargallo	220,000	110,000	^{2}15,000 ^{3}39,000	....	^{4}34,500	^{1}59,000	^{4}86,000	^{2}59,000	....	^{6}15,000	....	....	^{1}18.0	....
	Mobil Oil Italiana SpA-Naples	100,000	22,500	7,500	^{2}25,500	^{2}12,500	....	....	^{1}12,500 ^{5}12,000	^{2}3,500	....	....	650	....	....
	Raffineria di Roma SpA-Rome	81,500	11,300	^{3}28,400	....	^{2}14,200	....	^{2}17,000	^{2}19,900	....	^{4}5,200	....	9,620	....	....
	Raffineria Mediterranea Spa-Milazzo	160,000	72,000	....	^{1}28,000	^{2}11,000	....	^{4}14,000	^{1}10,000	^{1}3,600	....	....	....	....	....
	Raffineria Siciliana SrL-Gela	105,000	52,500	^{4}29,000	^{1}35,000	^{2}13,850	....	^{2}15,000 ^{4}17,000	^{1}16,500	^{2}10,000	^{1}6,700 ^{2}700 ^{4}8,050	....	....	^{3}17.0 ^{5}8.0	1,350
	Saras SpA-Sarroch	285,000	....	^{3}27,000	^{1}63,000	^{5}27,000	....	....	^{1}27,000 ^{4}60,000	^{2}6,800	....	....	....	^{5}12.0	....
	Sarpom-S. Martino Di Trecate	244,100	26,100	....	^{1}17,600	^{2}18,500 ^{4}8,100	....	....	^{2}68,300 ^{4}36,200	*1,800	....	....	17,600	....	....
	Novara	241,500	....	....	^{1}18,000	^{2}18,900 ^{4}8,900	....	^{4}38,000	^{2}69,700	*2,100	....	....	80,000	....	....
	Selm-Soc. Energia Montedison-Priolo	240,000	50,000	^{3}25,000	^{1}32,000	^{2}9,000	....	^{4}18,000	^{1}9,000	....	^{1}12,000 ^{2}1,300	....	....	....	....
	Tamoil Italia SpA-Cremona	95,000	....	^{3}33,000	....	^{2}12,400	....	^{4}11,000	^{1}16,000 ^{3}2,000	....	^{6}3,600	....	....	....	....
	Total	**2,803,600**	**687,400**	**412,900**	**305,700**	**334,850**	**59,000**	**376,300**	**675,900**	**41,700**	**82,550**	**33,610**	**156,370**	**85.9**	**1350**
IVORY COAST	Ste. Ivoirienne de Raffinage—Abidjan	59,000	30,000	....	....	^{2}13,600	^{1}14,200	12,800	^{4}17,200	....	....	....	....	....	....
	Ste. Multinationale de Bitumes—Abidjan	10,000	7,500	....	....	....	....	....	....	....	....	....	5,000	....	....
	Total	**69,000**	**37,500**	....	....	**13,600**	**14,200**	**12,800**	**17,200**	....	....	....	**5,000**	....	....
JAMAICA	Petrojam Ltd.-Kingston	34,200	1,900	....	....	^{1}3,240	....	....	^{1,2}5,850 ^{4}13,500	....	....	....	....	....	....
	Total	**34,200**	**1,900**	....	....	**3,240**	....	....	**19,350**	....	....	....	....	....	....

JAPAN

		Charge capacity, b/cd							Production capacity, b/cd					Coke
Company and refinery location	Crude	Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	tons/ day
Cosmo Oil CL–Chiba	....	....	....	....	....	....	^{1}57,000 ^{2}33,250	^{1}22,800 ^{2}7,600 ^{4}72,200	....	....	....	....	^{1}21.0 ^{2}62.0	....
Sakai	133,000	39,500	....	^{1}16,150	^{2}9,500	....	^{1}26,600 ^{2}16,340	^{1}13,300 ^{4}53,200	....	....	....	....	^{5}42.0	....
Sakay	104,500	32,300	....	^{1}18,525	^{2}6,650	....	^{2}19,000	^{1}8,100 ^{4}21,850	....	....	....	....	^{5}10.6	....
Yokkaichi City	166,250	70,300	....	^{1}23,750	^{2}5,700 ^{4}10,450	....	^{2}33,250	^{1}15,200 ^{4}61,700 ^{6}6,750	....	....	6,175	6,555	^{5}12.0	....
Fuji Oil CL–Sodegaura, Chiba	126,600	79,600	^{6}19,000	^{1}14,000	^{2}16,300	....	^{2}52,400	^{1}27,000 ^{4}47,900 ^{7}6,800	....	^{1}1,800	....	....	^{2}27.9	....
General Sekiyu Seisei KK–Sakai	140,400	63,000	....	^{1}32,500	^{2}26,100	....	^{3}36,000	^{2}36,000 ^{4}54,300	....	^{1}17,300	....	....	^{2}21.6	....
Idemitsu Kosan CL–Chita, Aichi	123,500	....	....	^{1}27,000	^{5}16,200	....	^{1}49,500	^{1}23,400 ^{4}43,200	^{1}5,400	....	....	....	^{2}63.4 ^{5}13.2	....
Himeji, Hyogo	104,500	....	....	....	^{2}12,600	....	^{1}36,000	^{1}25,200 ^{4}31,500	....	....	....	....	^{2}33.6	....
Ichihara, Chiba	199,500	57,000	....	^{1}37,800	^{2}15,300	^{3}9,450	^{1}36,000 ^{3}35,100	^{1}38,700 ^{4}47,700	....	....	5,170	7,900	^{2}64.9 ^{5}3.5	....
Tokuyama, Yamaguchi	95,000	47,500	....	^{1}20,700	....	....	^{3}40,500	^{1}13,500 ^{4}31,500	....	....	....	1,530	^{2}18.0	....
Tomakomai, Hokkaido	85,500	19,000	....	^{2}16,200	....	^{1}13,500	....	^{1}24,300 ^{4}22,860	....	....	....	....	^{4}2.4	....
Kainan Petroleum Refining CL Kaiwan City, Wakayama	64,000	37,500	....	....	....	....	....	^{4}20,000 ^{5}1,500 ^{6}9,000	....	....	11,600	17,500	^{2}4.0 ^{2}22.5	....
Kashima Oil CL–Kashima, Ibaragi	150,000	42,000	....	^{1}17,500	^{2}7,500	....	^{1}20,000 ^{5}14,000	^{1}14,500	.... ^{2}25,000 ^{4}50,000	....	....	....	....	....
Koa Oil CL–Marifu	110,000	49,000	^{5}22,800	^{1}20,000	^{2}9,700	....	^{2}10,000	^{1}11,000 ^{4}29,000	....	....	....	1,700	^{2}6.6	500
Osaka	80,000	55,000	....	^{1}18,000	^{2}9,000	....	^{2}15,000	^{1}11,000 ^{4}14,000	....	....	....	....	....	....
Kyokuto Petroleum Ltd–Chiba	120,000	55,000	....	....	^{2}19,000	^{1}28,000	....	^{1}23,000 ^{4}20,000	....	....	....	....	^{2}20.0	....
Kyushu Oil CL–Oita	130,000	66,000	....	^{1}16,500	^{2}8,000	....	^{2}33,000 ^{4}27,000	^{1}9,000	....	....	....	....	^{5}14.9	....
Mitsubishi Oil CL–Kawasaki	55,000	....	....	....	^{2}10,000	....	^{4}17,000	^{1}10,000	....	....	....	1,800	....	....
Mizushima	220,000	97,000	....	^{1}34,000	^{2}25,000 ^{6}18,500	^{1}11,000	^{1}45,000	^{1}43,500 ^{3}14,000 ^{6}4,100	*880	^{1}12,700	2,800	5,700	^{2}60.0	....
Nansei Sekiyu KK–Nishihara, Okinawa	50,000	....	....	....	^{2}9,600	....	^{4}15,000	^{2}37,400	....	....	....	....	....	....
Nichimo Sekiyu Seisei KK–Kawasaki	76,000	....	....	....	^{1}7,600	....	....	^{2}7,200 ^{4}22,800	....	....	....	....	....	....
Nihonkai Oil CL–Toyama	46,000	10,000	....	^{2}5,000	....	....	....	^{2}10,000 ^{4}7,500	....	....	....	....	....	....
Nippon Mining CL–Chita	85,000	40,000	....	^{1}13,000	^{2}22,000	....	^{2}37,000	^{2}43,000 ^{4}46,000	....	^{1}6,000 ^{2}2,400 ^{3}2,100	....	3,100	^{1}25.0 ^{4}9.2	....
Funakawa	6,000	2,740	....	....	....	....	....	....	....	....	900	....	....	....
Mizushima	190,200	107,000	....	^{1}38,000	^{2}20,000	....	^{1}31,000 ^{2}60,000	^{1}35,300 ^{4}59,600 ^{6}6,000	^{1}6,000	^{1}1,000	3,500	4,000	^{1}27.0 ^{2}28.3	....
Nippon Oil CL–Niigata	26,000	2,000	....	^{2}4,000	....	....	....	^{4}21,300	....	....	....	425	....	....

WORLDWIDE REFINING	Company and refinery location	Crude	Charge capacity, b/cd							Production capacity, b/cd					Coke
			Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	tons/ day
	Nippon Petroleum Refining CL–Muroran	150,000	61,000	....	[1]21,000	[2]21,000	[1]40,000	[1]12,500	[1]32,000 [4]48,000	....	....	....	4,160	[5]62.0	....
	Nakagusuku, Okinawa	....	....	....	....	[2]2,500	....	....	[1]2,500	....	....	....	....	....	....
	Negishi	305,000	130,000	[3]20,000	[1]39,000	[2]20,000 [6]30,000	....	[2]81,000	[1]53,000 [4]69,000 [7]3,000	[1]6,000	....	4,310	6,660	[5]22.0	....
	Yokohama	....	18,500	....	....	[2]1,300	....	....	[1]3,300 [4]7,300	....	....	1,250	....	....	....
	Okinawa Sekiyu Seisei–Yonashiro, Okinawa	57,000	....	....	....	....	....	[1]34,200 [2]13,500	[4]18,000	....	....	....	....	[2]42.7	....
	Seibu Oil CL–Yamaguchi	110,100	42,200	....	[1]19,900	[2]20,000	....	[1]40,100 [2]24,900	[2]48,300 [4]29,400	....	....	....	....	[1]42.4	....
	Showa Shell Sekiyu KK–Kawasaki	95,000	27,000	....	....	[2]14,000	....	[2]14,500 [5]26,700	[2]25,300	....	[6]5,400	....	900	....	....
	Niigata	27,100	....	....	....	[2]4,300	....	[4]2,000	[4]11,800	....	....	....	....	....	....
	Showa Yokkaichi Sekiyu CL–Yokkaichi	180,000	105,000	....	[1]25,000	[2]45,600	[4]40,000	....	[1]69,000	....	[1]4,000 [5]5,500	6,000	8,000	[1]30.5	....
	Taiyo Oil CL–Ehime	61,700	19,000	....	....	[2]5,400	[1]10,800	....	[1]7,380 [4]10,800	....	....	....	....	[2]54.7	....
	Toa Nenryo Kogyo–Kawasaki	190,000	116,900	....	[1]76,100	15,200	....	[3]74,000	[2]32,300 [4]31,400 [5]11,400	*9,500	....	....	....	[2]39.0	....
	Wakayama	157,700	58,600	....	[1]33,600	[2]34,200	....	[2]23,800	[2]33,700 [4]39,000 [5]20,900	[1]3,100	....	6,100	....	[1]16.0	....
	Toa Oil CL–Kawasaki	65,000	53,000	[6]24,000	[1]30,000	[2]8,000	....	[3]46,000	[1]17,000 [2]3,600 [4]22,000	....	....	....	....	[1]32.8	....
	Toho Oil CL–Owase	35,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Tohoku Oil CL–Sendai	77,900	51,500	....	....	[2]11,600	....	[2]29,900	[1]11,500 [4]17,700	....	....	....	5,800	....	....
	Total	**4,198,450**	**1,654,140**	**85,800**	**617,225**	**531,800**	**152,750**	**1,279,040**	**1,964,315**	**30,880**	**58,200**	**47,805**	**75,730**	**955.7**	**500**
JORDAN	Jordan Petroleum Refinery–Zerka	100,000	16,500	...	[1]4,250	[2]8,640	[1]4,800	....	[1]14,850	...	....	....	4,000	[2]7.9	....
	Total	**100,000**	**16,500**	....	**4,250**	**8,640**	**4,800**	....	**14,850**	....	....	....	**4,000**	**7.9**	....
KENYA	Kenya Petroleum Refineries Ltd.–Mombasa	90,000	1,700	....	....	[1]3,800 [2]5,200	....	....	[4]33,000	....	....	....	900	....	....
	Total	**90,000**	**1,700**	....	....	**9,000**	....	....	**33,000**	....	....	....	**900**	....	....
KOREA, N.	Government-owned, Unggi	**42,000**													
KOREA, S.	Honam Oil Refinery CL–Yocheon	342,000	9,000	[3]29,700	....	[2]15,300	....	....	[2]22,500	....	....	....	3,600	....	....
	Kukdong Oil CL–Busan[1]	10,000	7,000	....	....	....	....	....	[2]2,000 [6]1,200	....	....	2,000	4,000	[2]0.4	....
	Seosan	60,000	41,000	[5]19,000	....	[2]3,000	[1]22,000	....	[2]7,000 [4]12,000	....	....	1,000	3,665	[2]54.0	....
	Kyung In Energy CL–Inchon	60,000	....	....	....	[2]3,600	....	....	[1]3,600 [4]4,000	....	....	....	....	....	....
	Ssangyong Oil Refining CL–Onsan[2]	90,000	22,000	....	....	[1]4,000	[3]7,000	[4]21,000	[1]4,000 [2]1,100 [6]2,400	....	....	4,200	5,000	[2]14.0	....

WORLDWIDE REFINING	Company and refinery location	Crude	Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke tons/ day
		Charge capacity, b/cd								Production capacity, b/cd					
	Yukong Ltd.–Ulsan	305,000	4,400	....	....	[2]17,650 [6]18,900	....	....	[1]38,900 [4]10,500 [7]2,600	....	[1]11,930 [2]4,900 [3]800	....	2,600	....	....
	Total	**867,000**	**83,400**	**48,700**	....	**62,450**	**29,000**	**21,000**	**110,800**	....	**17,630**	**7,200**	**18,865**	**68.4**	....

Solvent extraction: [1]2,100 b/d. [2]8,000 b/d.

WORLDWIDE REFINING	Company and refinery location	Crude	Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke tons/ day
KUWAIT	Getty Oil Co. (subsidiary of Texaco Inc.)–Mina Al-Zour	72,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Kuwait National Petroleum Co.–Mina Abdulla	190,000	117,000	[5]54,000	....	....	[1]34,000	[1]88,000	[2]7,000 [4]66,000	....	....	....	....	[1]161.0	1,900
	Mina Al-Ahmadi	370,000	90,000	....	[1]28,000	[2]33,000	[1]34,000	[1]117,000	[1]34,000 [4]66,000	....	....	....	5,000	[1]156.0	....
	Shuaiba	187,000	131,000	....	[2]14,000	....	[1]60,000 [2]42,000	....	[1]25,000 [4]65,000	....	....	....	....	[1]210.0	....
	Total	**819,000**	**338,000**	**54,000**	**42,000**	**33,000**	**170,000**	**205,000**	**263,000**	....	....	....	**5,000**	**527.0**	**1,900**
LEBANON	Tripoli Oil Installations–Tripoli	20,000	12,730	....	[1]7,250	[2]4,392	....	[2]7,392	....	....	....	....	409	....	....
	Mediterranean Refining Co.–Sidon	17,000	....	....	....	[1]3,100	....	....	[1]3,100	....	....	....	....	....	....
	Total	**37,000**	**12,730**	....	**7,250**	**7,492**	....	**7,392**	**3,100**	....	....	....	**409**	....	....
LIBERIA	Liberia Petroleum Refining–Monrovia	15,000	1,000	....	....	[1]2,000	....	....	[1]2,300 [4]1,000	....	....	....	200	....	....
	Total	**15,000**	**1,000**	....	....	**2,000**	....	....	**3,300**	....	....	....	**200**	....	....
LIBYA	Azzawiya Oil Refining Co.–Azzawiya	120,000	3,432	....	....	[2]12,982	....	....	16,908 [5]18,718	....	....	635	1,716	....	....
	Ras Lanuf Oil & Gas Processing Co.–Ras Lanuf	201,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Sirte Oil Co.–Brega	8,400	....	....	....	[1]1,200	....	....	[2]1,600	....	....	....	....	....	....
	Total	**329,400**	**3,432**	....	....	**14,182**	....	....	**37,226**	....	....	**635**	**1,716**	....	....
MADAGASCAR	Solima–Managareza, Tamatave	**16,350**	**1,200**	**[3]7,000**	....	**[1]2,600**	....	**[2]3,600**	**[1]5,500**	....	....	....	....	....	....
MALAYSIA	Esso Malaysia Berhad–Port Dickson	47,300	4,750	....	....	[2]7,600	....	....	[1]14,250 [4]13,600	....	....	....	....	....	
	Petronas Penapisan Sdn. Berhad–Kerteh, Kemaman, Terengganu	27,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Sarawak Shell Berhad–Luton	45,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Shell Refining Co. Berhad–Port Dickson	90,000	7,000	....	....	[1]4,000 [4]13,000	....	....	[2]32,000 [4]5,000	....	....	....	4,000	....	....
	Total	**209,300**	**11,750**	....	....	**24,600**	....	....	**64,850**	....	....	....	**4,000**	....	....
MARTINIQUE	Ste. Anonyme de la Raffinerie des Antilles–Fort-de-France	12,000	....	....	....	[2]3,000	....	....	[1]4,850 [4]3,500	....	....	....	....	....	....
	Total	**12,000**	....	....	....	**3,000**	....	....	**8,350**	....	....	....	....	....	....

WORLDWIDE REFINING	Company and refinery location	Crude	Charge capacity, b/cd: Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Production capacity, b/cd: Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke tons/ day
MEXICO	Petroleos Mexicanos–Azcapotzalco	105,000	48,000	^{3}20,000	^{1}24,000	....	....	....	....	^{2}3,000 *430	....	....	....	....	....
	Cadereyta	235,000	137,000	....	^{1}40,000	^{2}20,000	....	^{4}50,000	^{1}36,000	....	....	....	....	....	....
	Ciudad Madero^{1}	195,000	81,500	^{3}8,000 ^{4}9,000	^{1}43,000	^{2}15,000	....	^{3}37,000	^{1}15,000	^{2}3,000 *420	....	....	....	^{1}10.0	260
	Minatitlan	200,000	83,000	....	^{1}24,000 ^{2}16,000	^{2}48,000	....	^{4}37,000	^{1}52,000	*600 ^{3}2,374	^{1}6,820 ^{2}1,400	500	....	....	....
	Poza Rica	50,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Reynosa	9,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Salamanca	235,000	101,200	^{3}4,000	^{1}40,000	^{2}24,800	^{2}18,000	^{4}26,000	^{1}33,000 ^{6}10,000	....	....	11,000	12,000	^{1}60.0	....
	Salina Cruz	165,000	75,000	....	^{1}40,000	^{6}20,000	....	^{4}50,000	^{1}25,000	....					
	Tula, Hidalgo	320,000	155,000	^{3}41,000	^{1}40,000	^{2}30,000	....	^{4}50,000	^{1}36,000	....	....	....	....	....	....
	Total	**1,514,000**	**680,700**	**82,000**	**267,000**	**157,800**	**18,000**	**250,000**	**207,000**	**7,450**	**10,594**	**11,500**	**12,000**	**70.0**	**260**

Solvent extraction: ^{1}38,000 b/cd.

WORLDWIDE REFINING	Company and refinery location	Crude	Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke tons/ day
MOROCCO	Samir–Mohammedia	129,000	20,000	....	....	^{2}24,000	....	....	^{1}24,000 ^{5}9,700 ^{6}2,100	....	....	2,100	1,900	....	....
	Ste. Cherifienne des Petroles–Sidi Kacem	25,600	7,400	....	^{2}5,600	^{1}2,800	....	....	....	....	....	....	....	....	....
	Total	**154,600**	**27,400**	**....**	**5,600**	**26,800**	**....**	**....**	**35,800**	**....**	**....**	**2,100**	**1,900**	**....**	**....**
MYANMAR	Myanma Petrochemcial Enterprise–Chauk	6,000	2,000	....	....	....	....	....	....	....	....	....	....	....	....
	Thanlyin	26,000	2,000	5,200	....	....	....	....	....	....	....	500	....	....	120
	Total	**32,000**	**4,000**	**5,200**	**....**	**....**	**....**	**....**	**....**	**....**	**....**	**500**	**....**	**....**	**120**

Formerly Burma

WORLDWIDE REFINING	Company and refinery location	Crude	Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke tons/ day
NETHERLANDS	BP Raffinaderij Nederland NV–Rotterdam	437,000	73,000	^{3}35,000	^{1}47,500	^{2}27,000	....	^{4}33,200	^{2}148,000	^{2}4,700	....	....	....	....	....
	Esso Nederland BV–Rotterdam	153,200	65,800	^{6}32,200	....	^{4}26,600	....	....	^{1}25,200 ^{2}9,900 ^{4}61,200 ^{5}13,500	....	....	....	....	^{1}21.0	....
	Kuwait Petroleum Europoort BV–Rotterdam^{1}	75,500	36,600	^{2}9,460 ^{3}6,400	....	^{4}19,000	....	....	^{1}36,600 ^{4}27,700 ^{6}5,500	....	^{6}5,950	4,400	4,000	^{5}2.0	....
	Shell Nederland Raffinaderij BV–Pernis	348,000	148,000	^{3}45,000	^{1}78,000	^{2}17,000 ^{6}42,000	^{2}22,000	^{2}77,000	^{2}138,000 ^{3}8,000 ^{6}300	^{2}6,800	....	7,100	5,500	^{1}59.0	....
	Smid & Hollander Raffinaderij BV–Amsterdam	10,000	8,000	....	....	....	....	....	....	....	....	....	6,000	....	....
	Texaco Petroleum Mij. (Nederland) BV–Pernis	207,000	28,000	^{3}27,000	....	^{2}29,000	....	^{4}38,000	^{1}29,000	....	....	....	....	....	....
	Total Raffinaderij Nederland NV–Vlissingen	150,000	45,000	....	....	^{6}18,000	^{1}30,000	....	^{1}18,000 ^{5}25,000	....	....	....	....	^{1}65.0	....
	Total	**1,380,700**	**404,400**	**155,060**	**125,500**	**178,600**	**52,000**	**148,200**	**545,900**	**11,500**	**5,950**	**11,500**	**15,500**	**177.0**	**....**

Solvent extraction: ^{1}3,200 b/cd.

WORLDWIDE REFINING	Company and refinery location	Charge capacity, b/cd								Production capacity, b/cd					Coke
		Crude	Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	tons/ day
NETHERLANDS ANTILLES	Refineria Isla Curazao SA– Emmastad	320,000	158,000	^{2}67,000	^{1}42,000	^{2}15,000	....	....	^{2}60,000 ^{4}34,000 ^{5}25,000 ^{6}2,500	^{2}5,000 *600	....	8,000	8,000	....	....
	Total	**320,000**	**158,000**	**67,000**	**42,000**	**15,000**	....	....	**121,500**	**5,600**	....	**8,000**	**8,000**	....	....
NEW ZEALAND	New Zealand Refining–Whangarei[1]	95,100	41,900	....	....	^{2}26,600	^{1}23,140	....	^{2}40,200 ^{4}19,000	....	....	....	800	^{5}44.0	....
	Total	**95,100**	**41,900**	....	....	**26,600**	**23,140**	....	**59,200**	....	....	....	**800**	**44.0**	....
	Solvent extraction: ^{1}16,100 b/cd.														
NICARAGUA	Esso Standard Oil SA Ltd.–Managua	14,500	2,000	....	....	^{1}2,800	....	....	^{2}4,800 ^{7}5,200	....	....	....	800	....	....
	Total	**14,500**	**2,000**	....	....	**2,800**	....	....	**10,000**	....	....	....	**800**	....	....
NIGERIA	Kaduna Refinery & Petrochemical Co. (NNPC)–Kaduna[1]	104,500	36,290	....	^{1}18,000	^{2}15,300	....	....	^{1}21,600 ^{4}15,750 ^{7}536	....	^{2}291	3,878	14,850	....	....
	Port Harcourt Refining Co. (NNPC)– Alesa Eleme	60,000	....	....	....	^{1}6,000	....	....	....	....	....	....	....	....	....
	Rivers State	150,000	54,000	....	^{1}40,000	^{6}33,000	....	....	^{1}33,000 ^{5}14,500	^{2}7,020 †2,274	^{4}3,610	....	....	....	....
	Warri Refinery & Petrochemical Co. (NNPC)–Warri	118,750	34,200	....	^{1}24,700	^{2}15,770	....	....	^{2}15,770 ^{5}8,075	^{2}2,850	....	....	....	....	....
	Total	**433,250**	**124,490**	....	**82,700**	**70,070**	....	....	**109,231**	**12,144**	**3,901**	**3,878**	**14,850**	....	....
	Solvent extraction: ^{1}9,492 b/cd. †Dimersol														
NORWAY	Esso Norge AS–Slagen-Valloy	90,000	4,000	^{3}28,000	....	^{2}10,000	....	....	^{2}20,000 ^{5}9,000	....	....	....	4,000	....	....
	Norske Shell AS–Sola	60,000	...	^{2}26,000	....	^{2}10,000	....	....	^{1}16,000 ^{4}9,000	....	....	....	....	....	....
	Rafinor AS-Mongstad	145,000	....	^{5}22,000	^{2}41,000	^{2}10,000 ^{5}16,000	....	....	^{1}26,000 ^{5}16,900 ^{7}7,800	*11,800	^{6}3,600	....	....	....	**469**
	Total	**295,000**	**4,000**	**76,000**	**41,000**	**46,000**	....	....	**104,700**	**11,800**	**3,600**	....	**4,000**	....	**469**
OMAN	Oman Refinery Co.–Mina Al Fahal	**76,932**	....	....	....	**^{2}15,386**	....	....	**^{2}19,506**	....		....	....	....	....
PAKISTAN	Attock Refinery Ltd.–Rawalpindi	30,500	1,000	....	....	....	....	....	....	....	....	....	....	....	....
	National Refinery Ltd.– Korangi, Karachi[1]	44,175	12,350	....	....	^{2}2,100	....	....	^{1}2,100 ^{5}9,358 ^{6}1,900	....	^{1}504	3,563	3,800	....	....
	Pakistan Refinery Ltd.–Karachi	46,250	....	....	....	^{4}3,000	....	....	^{5}20,000	....	....	....	....	....	....
	Total	**120,925**	**13,350**	....	....	**5,100**	....	....	**33,358**	....	**504**	**3,563**	**3,800**	....	....

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[1] Solvent Extraction: 5,605

WORLDWIDE REFINING	Company and refinery location	Crude	Charge capacity, b/cd Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Production capacity, b/cd Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke tons/ day
PANAMA	Refineria Panama SA–Las Minas	100,000	14,000	....	....	[2]7,500	....	....	[1]10,000 [4]20,000	....	....	....	5,000	....	....
	Total	**100,000**	**14,000**	....	....	**7,500**	....	....	**30,000**	....	....	....	**5,000**	....	....
PARAGUAY	Petroleos Paraguayos–Villa Elisa	**7,500**	....	....	....	....	....	....	....	....	....	....	....	....	....
PERU	Petróleos del Peru:														
	Conchan	5,670	3,915	....	....	....	....	....	....	....	....	....	....	....	....
	Iquitos, Loreto	9,450	....	....	....	....	....	....	....	....	....	....	....	....	....
	La Pampilla, Lima	93,900	11,400	....	[1]7,600	[3]1,680	....	....	....	....	....	....	....	....	....
	Marsella, Loreto	1,953	....	....	....	....	....	....	....	....	....	....	....	....	....
	Pucallpa	2,565	....	....	....	....	....	....	....	....	....	....	....	....	....
	Talara	58,900	21,600	....	[1]14,940	....	....	....	....	....	....	1,080	1,530	....	....
	Total	**172,438**	**36,915**	....	**22,540**	**1,680**	....	....	....	....	....	**1,080**	**1,530**	....	....
PHILIPPINES	Caltex (Philippines) Inc.–Batangas	63,000	18,100	....	[1]8,100	[2]8,100	....	....	[1-2]10,800 [4]14,400	....	....	....	....	....	....
	Petron Corp.–Limay, Bataan	155,000	32,000	....	[2]15,000	[1]6,800 [2]17,000	....	[4]18,000	[2]52,000	†*4,400	....	....	10,000	....	....
	Philippine Petroleum Corp.–Pililla	....	20,500	....	....	....	....	....	....	....	....	3,400	....	....	....
	Pilipinas Shell Petroleum–Tabangao	65,800	....	....	....	[1]8,000	....	[2]5,000	[4]14,000	....	....	....	....	....	....
	Total	**283,800**	**70,600**	....	**23,100**	**39,900**	....	**23,000**	**91,200**	**4,400**	....	**3,400**	**10,000**	...	...
POLAND	Government-owned refineries at Czechowice, Gdansk, Glinik Mariampolski, Jasto, Jealicze, Kralaty, L. Warynski, Trzebinia. Crude capacity 133,000 b/d.														
	Mazovian Refinery & Petrochemical Works Plock	252,454	116,082	....	[1]48,705	[2]31,186	....	....	[1]31,186 [5]39,472	[2]4,353	[1]11,161 [2]1,374	7,433	....	....	....
	Total	**385,454**	**116,082**	....	**48,705**	**31,186**	....	....	**70,658**	**4,353**	**12,535**	**7,433**	....	....	....
PORTUGAL	Petrogal–Lisbon	....	18,900	....	[2]10,100	....	....	[1]3,400	....	....	....	....	700	....	....
	Leça da Palmeira, Porto	88,300	11,000	....	....	[2]14,200 [4]10,500	....	....	[1]38,600 [4]7,300 [6]3,000	.... [1]8,200	3,000	2,700	....	....	
	Sines	225,000	25,400	....	....	[5]27,500	[4]10,200	[4]31,400 [5]15,000	[1]27,500	....	....	....	2,400	....	....
	Total	**313,300**	**55,300**	....	**10,100**	**52,200**	**10,200**	**49,800**	**76,400**	**8,200**	**3,000**	**2,700**	**3,100**		
PUERTO RICO	Caribbean Petroleum Corp.–Bayamón	38,000	20,000	....	[1]13,500	[2]6,500	....	....	[1]6,800 [4]11,000	....	....	....	1,000	....	....

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†* Polymerization Mothballed.

WORLDWIDE REFINING	Company and refinery location	Crude	Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke tons/ day
			Charge capacity, b/cd							Production capacity, b/cd					
	Puerto Rico Sun Oil Co.-Yabucoa[1]	85,000	48,000	....	....	20,000	[3]15,000	....	[1]20,000 [4]10,000	....	....	....	....	[2]18.0	....
	Total	**123,000**	**68,000**	....	**13,500**	**26,500**	**15,000**	....	**47,800**	....	....	....	**1,000**	**18.0**	....
	Solvent extraction: [1]16,000 b/cd.														
QATAR	National Oil Distribution Co.-Umm Said	62,000	....	....	....	[2]2,200 [6]9,830	....	[2]12,000	[2]20,500	....	....	....	....	....	....
	Total	**62,000**	....	....	....	**12,030**	....	**12,000**	**20,500**	....	....	....	....	....	....
ROMANIA	Government-owned refineries at Bacau, Borzesti, Brazi, Brazov, Cimpina, Darmanesti, G. Gheorghiu Dej, Navodari, Onesti, Pitesti, Ploesti, Sulpacu, and Telaejen.														
	Total	**617,000**													
SAUDI ARABIA	Saudi Arabian Oil Co. (Saudi Aramco)-Ras Tanura	53,000	155,000	....	....	[2]50,000	....	....	[1]55,000	....	....	....	13,000	....	....
	Arabian Oil CL-Ras Al Khafji	30,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Jeddah Oil Refinery-Jeddah	95,000	16,000	....	[1]11,000	[2]3,000	....	....	[1]3,000	....	....	....	....	....	....
	Petromin-Mobil-Yanbu	250,000	106,000	....	[1]66,000	[6]32,000	....	....	[1]32,000 [4]40,000	[2]12,500	....	....	10,000	....	....
	Petromin-Shell-Al-Jubail[1]	275,000	87,000	[3]34,000	....	[6]19,000	[2]47,000	[1]50,000	[1]19,000 [2]65,000 [4]58,000	.... [2]5,600	[1]4,900	....	....	[1]84.0	....
	Riyadh Oil Refinery-Riyadh[2]	134,000	52,655	....	.... [5]5,400	[2]28,600	[2]31,100	.... [4]12,900	[2]30,900	....	8,000	....	5,500	117.0	....
	Yanbu Petromin Refinery-Yanbu	170,000	....	....	....	[2]35,000	....	....	[1]35,000 [4]15,200	....	....	....	....	....	....
	Total	**1,007,000**	**416,655**	**34,000**	**82,400**	**167,600**	**78,100**	**62,900**	**353,100**	**18,100**	**13,900**	....	**28,500**	**201.0**	....
	Solvent extraction: [1]12,500 b/cd. [2]8,800 b/cd.														
SENEGAL	Ste. Africaine de Raffinage-M'Bao (Dakar)	**24,000**	....	....	....	**[4]2,600**	....	....	**2,600**	....	....	....	....	....	....
SIERRA LEONE	Sierra Leone Petroleum Refining Co.-Freetown	**10,000**	....	....	....	....	....	....	....	....	....	....	....	....	....
SINGAPORE	BP Refinery Singapore PL-Pasir Panjang	30,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Esso Singapore PL-Pulau Ayer Chawan	170,000	41,800	[2]6,000 [3]26,800	....	[2]11,600	....	....	[2]19,000 [4]48,400	....	....	7,000	3,400	....	....
	Mobil Oil Singapore PL-Jurong	193,000	70,000	[3]45,000	....	[2]18,000	....	....	[1]22,000 [4]36,000	....	....	....	....	....	....
	Shell Eastern Petroleum Ltd.-Pulau Bukom	258,000	85,600	[2]64,700	....	[2]6,800 [6]13,900	[1]21,600	[2]44,600	[2]115,200	....	....	5,800	4,300	[1]40.0	....

			Charge capacity, b/cd							Production capacity, b/cd					
	Company and refinery location	Crude	Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke tons/ day
	Singapore Petroleum CPL†–Pulau Merlimau	179,000	60,600	^{3}28,000	....	^{4}11,000	^{1}10,400 ^{4}17,000	^{4}36,000	^{1}11,000	....	....	....	4,300	^{2}18.0 ^{4}14.0 ^{5}7.0	....
	Total	**830,000**	**258,000**	**170,500**	**....**	**61,300**	**49,000**	**80,600**	**251,600**	**....**	**....**	**12,800**	**12,000**	**79.0**	**....**

†Singapore Petroleum CPL shares percentages of refinery capacities.

	Company and refinery location	Crude	Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke tons/ day
SOMALIA	Iraqsoma Ref. Co.–Mogadishu	**10,000**	....	....	....	....	....	....	....	....	....	....	....	....	....
SOUTH AFRICA	Caltex Oil SA PL–Cape Town	90,000	44,000	^{3}9,500	^{1}25,000	^{2}10,500	....	^{4}22,300	^{1}14,250	....	....	....	1,140	....	....
	Gencor–Durban	65,000	32,000	^{3}11,000	^{1}15,000	^{2}15,000	....	....	^{1}21,000 ^{5}28,000	^{2}2,200	$^{4-6}$6,000	3,000	4,000	....	....
	National Petroleum Refiners of South Africa PL–Sasolburg OFS	78,500	28,000	....	^{1}17,400	^{2}11,300	^{1}8,600 ^{2}9,400	....	^{1}11,300 ^{4}10,600	^{2}4,800	^{4}3,400	....	1,000	^{1}25.0 ^{5}9.0	....
	Shell and BP South Africa Petroleum Refineries PL–Durban	200,000	....	^{3}43,000	^{1}27,000	^{2}26,000	....	^{4}55,000	^{4}57,000	....	....	....	....	....	....
	Total	**433,500**	**104,000**	**63,500**	**84,400**	**62,800**	**18,000**	**77,300**	**142,150**	**7,000**	**9,400**	**3,000**	**6,140**	**34.0**	**....**
SPAIN	Asfaltos Españoles SA–Tarragona	21,000	16,800	....	....	....	....	....	....	....	....	....	15,000	....	....
	Cia. Española de Petróles–San Roque (Cádiz)	160,000	40,000	^{3}35,000	^{1}36,000	^{2}35,000	....	....	^{4}24,000 ^{5}15,000	....	^{1}12,500 ^{2}1,800	....	....	....	....
	Tenerife	130,000	12,000	^{3}35,000	....	^{2}14,000	....	....	^{1}15,000 ^{3}20,000	....	....	....	8,000	....	....
	Petróleos del Mediterraneo–Castellón de la Plana	120,000	34,200	....	^{1}23,300	^{2}13,400	....	....	^{1}13,400 ^{2}12,100 ^{4}36,200	....	....	....	1,833	....	....
	Petronor SA–Somorrostro, Vizcaya	220,000	90,000	^{3}40,000	^{1}40,000	^{2}30,500	....	^{3}35,000	^{2}45,000 ^{4}40,000	....	....	....	3,300	^{2}12.0	....
	Repsol Petroleo SA–Cartagena, Murcia	112,000	18,000	....	....	^{2}25,000	....	^{4}30,000	^{2}29,000	....	....	3,500	3,500	....	....
	La Coruña	135,000	29,000	^{2}10,500 ^{5}13,500	^{1}28,000	^{2}22,000	....	^{4}17,000	^{1}22,000	....	....	....	....	....	550
	Puertollano, Ciudad Real	135,000	62,000	....	^{1}30,000	^{2}18,000	....	^{2}9,500 ^{4}22,000	^{2}18,000	^{2}1,700	....	3,000	3,500	^{2}6.2	....
	Tarragona	180,000	72,000	^{3}30,000	^{2}16,000	....	^{1}15,000	^{2}22,000 ^{4}20,600	^{2}16,000	....	....	....	....	^{1}10.0	....
	Unión Explosivos Rio Tinto SA–La Rábida, Huelva	80,000	25,000	^{3}10,000	....	^{2}14,100	....	....	^{1}14,100 ^{4}11,000 ^{6}2,800	....	^{1}2,420 ^{2}3,500 ^{3}1,800	1,900	6,900	^{1}25.0 ^{5}6.0	....
	Total	**1,293,000**	**399,000**	**174,000**	**173,300**	**172,000**	**15,000**	**156,100**	**333,600**	**1,700**	**22,020**	**8,400**	**42,033**	**59.2**	**550**
SRI LANKA	Ceylon Petroleum Corp.–Sapugaskanda	50,000	2,400	^{3}12,500	....	^{2}3,750	....	^{2}2,100	^{1}8,000 ^{4}7,300	....	....	....	1,000	....	....
	Total	**50,000**	**2,400**	**12,500**	**....**	**3,750**	**....**	**2,100**	**15,300**	**....**	**....**	**....**	**1,000**	**....**	**....**
SUDAN	Port Sudan Refinery Ltd.–Port Sudan	**25,000**	....	....	....	^{1}2,100	....	....	^{4}**9,400**	....	....	....	....	....	....

WORLDWIDE REFINING	Company and refinery location	Crude	Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke tons/ day
			Charge capacity, b/cd							Production capacity, b/cd					
SWEDEN	AB Nynas Petroleum–Gothenburg	12,500	9,000	....	....	....	....	....	....	....	....	....	8,500	....	....
	Nynäshamn	28,000	31,000	....	....	....	....	....	[6]2,500	....	....	2,500	20,000	[2]1.9	....
	BP Raffinaderi–Gothenburg	106,000	....	....	....	[2]20,500	....	....	[4]45,000	....	....	....	....	....	....
	Shell Raffinaderi BV–Gothenburg	81,000	30,000	[2]25,000	....	[2]17,000	....	[2]17,000	[2]28,000 [4]5,000	....	[6]4,000	....	....	....	....
	Skandinaviska Raffinaderi AB–Brofjorden-Lysekil	200,000	65,000	[3]40,000	[1]25,000	[2]34,500	....	[2]48,000	[2]43,500 [4]30,500	*3,500	....	....	....	....	....
	Total	**427,500**	**135,000**	**65,000**	**25,000**	**72,000**	....	**65,000**	**154,500**	**3,500**	**4,000**	**2,500**	**28,500**	**1.9**	....
SWITZERLAND	Raffinerie de Cressier SA–Cressier	60,000	24,000	[2]11,000 [3]9,000	....	[2]16,000	....	[2]8,000	[1]27,000 [4]5,500	....	[6]3,600	....	5,200	....	....
	Raffinerie du Sud-Ouest SA–Collombey	72,000	....	....	....	[2]10,000	....	....	[1]16,700	....	....	....	....	....	....
	Total	**132,000**	**24,000**	**20,000**	....	**26,000**	....	**8,000**	**49,200**	....	**3,600**	....	**5,200**	....	....
SYRIA	Banias Refining Co.–Banias	126,350	54,101	[3]24,099	....	[4]16,728	....	....	[1]16,769 [4]6,828 [5]14,266	....	....	....	4,016	....	....
	Homs Refinery Co.–Homs	117,394	7,245	[5]12,285	....	[2]2,266 [4]9,086	....	[2]3,024 [4]23,591	[1]15,412 [4]6,720	....	[6]2,850	....	4,474	[2]9.91 [5]11.86	530
	Total	**243,744**	**61,346**	**36,384**	....	**28,080**	....	**26,615**	**59,995**	....	**2,850**	....	**8,490**	**21.71**	**530**
TAIWAN,	Chinese Petroleum Corp.–Kaohsiung	446,500	83,125	[5]14,250	[1]23,750	[2]19,000 [4]19,000	[1]19,000	[1]28,500 [2]42,750 [4]56,050	[1]38,000	[2]3,325	[1]9,800 [2]1,205 [3]1,205	....	6,000	[2]50.0	800
	Tao-Yuan	123,500	34,200	....	....	[2]21,375	....	[1]28,500 [2]19,000	[1]21,375 [4]15,200	....	....	....	3,314	[2]45.0	....
	Total	**570,000**	**117,325**	**14,250**	**23,750**	**59,375**	**19,000**	**174,800**	**74.575**	**3,325**	**11,005**	**1,205**	**9,314**	**95.0**	**800**
TANZANIA	Tanzanian & Italian Petroleum Refining CL–Kigamboni, Dar es Salaam	**13,500**	....	....	....	**[2]3,000**	....	....	**[4]5,000**	....	....	....	....	....	....
THAILAND	Esso Standard Thailand Ltd.–Sriracha	73,000	6,200	....	....	[5]8,600	....	....	[2]16,200 [4]10,000 [5]11,400	....	....	....	2,500	....	....
	Petroleum Authority of Thailand–Bangchak, Bangkok	61,750	....	....	....	[2]9,450	....	[5]3,150	[1]4,950 [2]5,850 [7]16,200	....	....	....	....	[1]4.7	....
	Thai Oil CL–Sriracha	80,100	21,600	[3]17,600	[1]9,500 [2]6,200	[1]2,700	....	[2]9,100	[2]32,600	....	....	....	1,500	....	....
	Total	**214,850**	**27,800**	**17,600**	**15,700**	**20,750**	....	**12,550**	**97,200**	....	....	....	**4,000**	**4.7**	....
TRINIDAD	Trinidad and Tobago Oil CL–Pointe-a-Pierre	220,000	166,000	[3]18,000	[1]28,000	[4]25,000	....	[2]100,000	[5]18,000 [6]3,800	[1]2,200 *450	[1]2,800	2,700	....	....	....
	Point Fortin	80,000	5,000	....	....	[3]6,000	....	[5]4,500	[4]20,000	....	....	....	2,000	....	....
	Total	**300,000**	**171,000**	**18,000**	**28,000**	**31,000**	....	**104,500**	**41,800**	**2,650**	**2,800**	**2,700**	**2,000**	....	....

WORLDWIDE REFINING				Charge capacity, b/cd							Production capacity, b/cd					
		Company and refinery location	Crude	Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke tons/ day
TUNISIA		Ste. Tunisienne Industries des Raffinage–Bizerte	**34,000**	....	....	....	**3,300**	....	....	....	....	....	....	....	....	....
TURKEY		Anadolu Tasfiyehanesi AS–Mersin	90,000	....	....	....	[2]10,000	....	....	[1]22,000 [4]11,000	....	....	....	....	....	....
		Turkish Petroleum Refineries Corp.: Aliaga-Izmir[1]	226,440	37,500	....	[1]14,000	[2]10,700	....	....	[1]12,000 [4]14,500	....	....	4,000	10,000	[5]0.4	....
		Batman, Siirt	24,350	4,140	[2]4,500	....	[2]1,300	....	....	[1]1,300	....	....	....	4,640	....	....
		Izmit	248,455	88,060	....	[1]20,128	[2]20,285	....	....	[1]20,285 [4]22,015 [5]20,757	....	....	....	8,800	....	....
		Kirikkale	112,849	29,676	....	....	[2]20,342	....	[2]15,096	[1]20,342 [2]8,825	....	....	6,177	....	....	
		Total	**702,094**	**159,376**	**4,500**	**34,128**	**62,627**	....	**15,096**	**153,024**	....	....	**10,177**	**23,440**	**0.4**	....

Solvent extraction: [1]11,700 b/cd (furfural), 6,700 b/cd (propane deasphalting).

WORLDWIDE REFINING				Charge capacity, b/cd							Production capacity, b/cd					
		Company and refinery location	Crude	Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke tons/ day
UNITED KINGDOM	**England**	Conoco Ltd.–South Killingholme	130,000	104,000	[2]40,000 [5]60,000	[1]38,000 [2]50,000	....	....	....	[4]76,000 [5]45,000 [7]30,000	[6]19,000 *10,700	[1]3,000	....	....	....	2,150
		Eastham Refinery Ltd.–Eastham, Cheshire	12,000	10,500	....	....	....	....	....	....	....	....	....	8,000	....	....
		Ellesmere Port	22,000	19,250	....	....	....	....	....	....	....	....	....	15,000	....	....
		Esso Petroleum CL–Fawley	300,200	120,840	....	[1]76,500	[2]27,900 [4]22,500	....	....	[1-2]73,260 [4-5]104,130 [6]7,200	*12,600	[6]16,150	7,200	7,650	....	....
		Lindsey Oil Refinery Ltd.– Killingholm, South Humberside	190,000	100,000	[3]31,000	[1]51,000	[2]35,000	....	....	[1]17,400 [2]33,300 [3]2,100 [4]44,000	[2]6,200 *2,100	....	....	7,500	....	....
		Mobil Oil CL–Coryton, Essex	145,000	86,000	....	[1]47,000	[4]32,000	....	....	[1]41,000 [3]14,000	[2]16,000	[4]8,500	5,500	1,700	....	....
		Phillips Imperial Petroleum Ltd.– Port Clarence	100,000	....	....	....	....	....	....	....	....	....	....	....	....	....
		Shell U.K. Ltd.–Shell Haven	92,000	30,000	....	....	[6]32,000	[1]22,000	....	[1]34,000 [4]29,000	....	....	....	3,000	....	....
		Stanlow	262,000	90,000	....	[1]59,000	[2]29,000 [6]27,000	....	[2]41,000	[1]56,000 [2]14,000	.... [2]5,000	[1]9,000	4,500	8,000	....	....
		Total	**1,253,200**	**560,590**	**131,000**	**321,500**	**205,400**	**22,000**	**41,000**	**620,390**	**71,600**	**36,650**	**17,200**	**50,850**	....	**2,150**
	Scotland	BP Refinery Grangemouth Ltd.– Grangemouth	178,500	76,000	....	[1]19,000	[2]32,000	....	....	[4]62,500	[2]3,800	....	....	....	[1]77.4	....
		Briggs Oil Ltd.—Dundee	6,400	6,000	....	....	....	....	....	....	....	....	....	....	....	....
		Total	**184,900**	**82,000**	....	**19,000**	**32,000**	....	....	**62,500**	**3,800**	...	...	...	**77.4**	...
	Wales	Amoco UK Ltd.–Milford Haven	108,000	55,000	....	[1]32,500	[2]17,800	....	....	[2]17,800 [4]30,000	[2]3,300 1,300	....	....	....	....	....
		BP Refinery Llandarcy Ltd.– Llandarcy, Neath	....	27,000	....	....	....	....	....	....	....	....	4,400	....	....	....
		Gulf Oil-GB–Milford Haven	105,000	37,000	....	....	[2]18,000	....	....	[2]29,000 [3]14,000	....	....	....	....	....	....

WORLDWIDE REFINING	Company and refinery location	Crude	Charge capacity, b/cd							Production capacity, b/cd					Coke
			Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	tons/ day
	Pembroke Cracking Co. (65% Texaco, 35% Gulf Oil-GB)	....	....	....	[1]86,000	....	....	....	....	[2]22,000	[4]10,000	....	....	....	....
	Texaco Ltd.–Pembroke, Dyfed	180,000	91,000	[3]26,000	....	[6]39,000	....	[4]34,000	[1]39,000	....	....	....	....	....	....
	Total	**393,000**	**210,000**	**26,000**	**118,500**	**74,800**	....	**34,000**	**129,800**	**26,600**	**10,000**	**4,400**	....	....	....
	Total United Kingdom	**1,831,100**	**852,590**	**157,000**	**459,000**	**312,200**	**22,000**	**75,000**	**811,390**	**102,000**	**46,650**	**21,600**	**50,850**	**77.4**	**2,150**
	†Dimersol.														
URUGUAY	Ancap–La Teja, Montevideo	**33,000**	**13,000**	....	**[1]4,100**	**[1]2,500**	....	....	**[4]3,700**	....	....	....	....	....	....
U.S.S.R.	Government-owned refineries at Achinsk, Angarsk, Baku, Batumi, Chimkent, Drogobych, Fergana, Gorki, Grozny, Guryev, Ishimbai, Khabarovsk, Kherson, Kirishi, Komsomolsk, Krasnovodsk, Kremenchug, Kuibyshev, Lisichansk, Mazheikiai, Moscow, Mozyr, Nadvornaya, Nizhnekamsk, Odessa, Omsk, Orsk, Pavlodar, Perm, Polotsk, Ryazan, Saratov, Syzran, Tuapse, Ufa, Ukhta, Vannovskiy, Volgograd, and Yaroslavl.														
	Total	**12,300,000**													
VENEZUELA	Corpoven–El Palito, Carabobo	105,000	63,200	....	[1]45,000	[1]6,000	....	....	....	[1]20,500	....	....	....	....	....
	El Toreño, Barinas	4,500	....	....	....	....	....	....	....	....	....	....	....	....	....
	Puerto La Cruz, Anzoategui	195,100	....	....	[1]11,400	....	....	....	....	[1]2,100	....	....	....	....	....
	San Roque, Anzoategui	5,200	1,700	....	....	....	....	....	....	....	....	....	....	....	....
	Lagoven–Judibana, Falcon	600,000	343,600	[6]49,700	[1]76,100	....	....	[2]162,000 [4]65,300	....	[2]16,000	[4]8,400	1,890	39,800	[1]82.9	100
	Maraven–Punta Cardon, Falcon	291,300	152,100	[3]88,300	[1]60,600	....	....	[2]33,700 [4]35,100	....	[1]22,650	[4]9,900	5,700	....	[1]26.0	....
	Total	**1,201,100**	**560,600**	**138,000**	**193,100**	**6,000**	....	**296,100**	....	**61,250**	**18,300**	**7,590**	**39,800**	**108.9**	**100**
VIRGIN ISLANDS	Hess Oil Virgin Islands Corp.–St. Croix	545,000	215,000	[3]80,000	....	[2]125,000	....	[2]130,000	[2]125,000 [4]165,000	....	[1]30,000 [5]15,000	....	....	....	....
	Total	**545,000**	**215,000**	**80,000**	....	**125,000**	....	**130,000**	**290,000**	....	**45,000**	....	....	....	....
YEMEN, N.	Yemen Hunt Oil Co.–Marib	**10,000**	....	....	....	**[1]2,500**	....	....	....	....	....	....	....	....	....
YEMEN, S.	Aden Refinery Co.–Little Aden	**161,500**	**9,500**	....	....	**[1]10,800**	....	**[4]2,700**	....	....	....	....	**2,000**	....	....
	Solvent extraction: 7,920 b/cd.														
YUGOSLAVIA	Bosanski Brod[1]	112,835	44,609	....	....	[2]7,612 [6]13,500	[3]7,200	....	[1]20,200 [4]13,438	....	....	....	13,310	[1]14.0	....
	Lendava	14,600	....	....	....	....	....	....	....	....	....	....	....	....	....
	Novi Sad	63,000	30,000	....	....	[2]8,200	....	[4]4,600	[1]10,700 [4]4,400 [6]4,600	....	....	1,500	4,000	[1]0.5	....
	Pancevo	108,000	44,850	[3]21,700	[1]20,750	[2]8,800	....	[4]5,000 [5]9,370	[1]8,800	[1]3,400	[1]215	....	6,300	....	....
	Rijeka	160,000	43,000	[2]8,000	[1]21,300	[2]17,500	....	[4]3,000	[1]17,500 [6]5,000	....	[1]2,800 [2]1,535 [6]9,000	2,200	....	[1]0.4	....

			Charge capacity, b/cd							Production capacity, b/cd					
	Company and refinery location	Crude	Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke tons/ day
	Sisak	150,000	15,700	[5]5,930	[1]10,000	[2]19,000	....	....	[1]16,900 [3]3,640 [5]2,700	....	[1]4,900	....	3,715	....	137
	Zagreb	700	600	....	....	....	....	....	....	....	....	1,200	....	....	....
	Total	**609,135**	**178,759**	**35,630**	**52,050**	**74,612**	**7,200**	**21,970**	**107,878**	**3,400**	**18,450**	**4,900**	**27,325**	**14.9**	**137**

Solvent extraction: [1]3,300 b/cd (deasphalting).

ZAIRE	Sozir–Muanda	**17,000**	....	....	....	**[2]3,500**	....	....	**[2]5,000**	....	....	....	....	....	....
ZAMBIA	Indeni Petroleum Refinery CL–Bwana Nkubwa Area, Ndola	**24,500**	**2,400**	....	....	**[2]5,600**	....	....	**[4]9,000**	....	....	....	**60**	....	....

Baker Hughes rig count

	1-30-89	2-1-88
Alabama	10	15
Alaska	12	12
Arkansas	6	7
California	44	53
Land	35	45
Offshore	9	8
Colorado	18	31
Florida	1	2
Illinois	4	8
Indiana	0	0
Kansas	38	37
Kentucky	5	1
Louisiana	129	187
N. Land	12	15
S. Inland Waters	13	30
S. Land	34	49
Offshore	70	93
Maryland	0	0
Michigan	13	27
Mississippi	27	14
Montana	2	9
Nebraska	1	3
New Mexico	25	36
New York	2	3
North Dakota	10	15
Ohio	22	30
Oklahoma	132	117
Pennsylvania	26	21

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database

	1-30-89	2-1-88
South Dakota	1	0
Texas	228	274
Offshore	19	19
Inland Waters	1	0
Dist. 1	0	4
Dist. 2	8	13
Dist. 3	28	26
Dist. 4	33	41
Dist. 5	7	12
Dist. 6	38	18
Dist. 7B	7	15
Dist. 7C	12	13
Dist. 8	25	58
Dist. 8A	19	26
Dist. 9	21	12
Dist. 10	10	17
Utah	4	7
West Virginia	12	8
Wyoming	20	39
Others, Nv.-2,Tn.-1, Va.-1,Wa.-1	5	8
Total U.S.	**797**	**964**
Cum. Avg. to Date	**841**	**1,053**
Canada	162	270
Canada-Offshore	1	3
Grand Total	**960**	**1,237**

Rotary rigs from spudding in to total depth

Baker Hughes rig count

	2-27-89	2-29-88
Alabama	8	13
Alaska	9	11
Arkansas	7	8
California	43	56
Land	35	48
Offshore	8	8
Colorado	18	28
Florida	3	0
Illinois	4	8
Indiana	0	0
Kansas	36	41
Kentucky	1	2
Louisiana	126	172
N. Land	15	15
S. Inland Waters	17	31
S. Land	32	42
Offshore	62	84
Maryland	0	0
Michigan	19	27
Mississippi	25	17
Montana	5	9
Nebraska	3	3
New Mexico	24	28
New York	4	1
North Dakota	12	16
Ohio	16	19
Oklahoma	113	145
Pennsylvania	25	22

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database

	2-27-89	2-29-88
South Dakota	1	1
Texas	218	304
Offshore	18	19
Inland Waters	1	3
Dist. 1	2	5
Dist. 2	11	12
Dist. 3	24	27
Dist. 4	29	42
Dist. 5	6	11
Dist. 6	29	26
Dist. 7B	8	11
Dist. 7C	15	19
Dist. 8	29	59
Dist. 8A	21	43
Dist. 9	16	11
Dist. 10	9	16
Utah	3	5
West Virginia	11	7
Wyoming	19	35
Others, Nv.-2,Tn.-1, Wa.-1	4	5
Total U.S.	**757**	**983**
Cum. Avg. to Date	**806**	**1,020**
Canada	226	348
Canada-Offshore	1	3
Grand Total	**984**	**1,334**

Rotary rigs from spudding in to total depth

Baker Hughes rig count

	3-27-89	3-28-88
Alabama	8	10
Alaska	11	12
Arkansas	4	8
California	54	58
Land	47	52
Offshore	7	6
Colorado	18	28
Florida	1	0
Illinois	5	3
Indiana	0	0
Kansas	41	45
Kentucky	4	2
Louisiana	128	165
N. Land	10	9
S. Inland Waters	18	31
S. Land	39	35
Offshore	61	90
Maryland	0	0
Michigan	17	22
Mississippi	17	17
Montana	7	8
Nebraska	1	2
New Mexico	28	24
New York	2	0
North Dakota	12	16
Ohio	8	9
Oklahoma	118	137
Pennsylvania	14	9

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database

	3-27-89	2-28-88
South Dakota	0	0
Texas	234	305
Offshore	21	15
Inland Waters	1	10
Dist. 1	2	6
Dist. 2	8	11
Dist. 3	24	33
Dist. 4	33	46
Dist. 5	7	8
Dist. 6	31	23
Dist. 7B	14	15
Dist. 7C	17	19
Dist. 8	31	57
Dist. 8A	23	35
Dist. 9	11	12
Dist. 10	11	15
Utah	5	7
West Virginia	6	5
Wyoming	19	36
Others, Nv.-1,Or.-1, Tn.-1,Wa.-1	4	7
Total U.S.	**766**	**935**
Cum. Avg. to Date	**789**	**998**
Canada	212	228
Canada-Offshore	2	1
Grand Total	**980**	**1,164**

Rotary rigs from spudding in to total depth

Baker Hughes rig count

	4-24-89	4-25-88
Alabama	6	7
Alaska	11	11
Arkansas	2	5
California	45	62
Land	40	56
Offshore	5	6
Colorado	20	34
Florida	2	2
Illinois	5	3
Indiana	0	0
Kansas	40	42
Kentucky	5	5
Louisiana	137	169
N. Land	18	12
S. Inland Waters	20	29
S. Land	42	38
Offshore	57	90
Maryland	0	0
Michigan	8	17
Mississippi	18	15
Montana	5	5
Nebraska	1	1
New Mexico	36	34
New York	0	0
North Dakota	12	16
Ohio	2	5
Oklahoma	138	131
Pennsylvania	2	5

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database

	4-24-89	4-25-88
South Dakota	1	0
Texas	232	290
Offshore	26	17
Inland Waters	1	12
Dist. 1	2	5
Dist. 2	7	16
Dist. 3	25	25
Dist. 4	32	39
Dist. 5	6	9
Dist. 6	28	16
Dist. 7B	16	20
Dist. 7C	17	18
Dist. 8	26	45
Dist. 8A	21	37
Dist. 9	13	16
Dist. 10	12	15
Utah	4	7
West Virginia	11	6
Wyoming	17	30
Others, Nv.-2,Tn.-1, Va.-1,Wa.-1	5	6
Total U.S.	**767**	**908**
Cum. Avg. to Date	**785**	**979**
Canada	61	84
Canada-Offshore	2	1
Grand Total	**830**	**993**

Rotary rigs from spudding in to total depth

Baker Hughes rig count

	5-29-89	5-30-88
Alabama	8	8
Alaska	9	14
Arkansas	6	4
California	51	69
Land	47	64
Offshore	4	5
Colorado	20	25
Florida	2	2
Illinois	5	3
Indiana	0	0
Kansas	40	40
Kentucky	5	4
Louisiana	134	163
N. Land	12	13
S. Inland Waters	18	26
S. Land	32	32
Offshore	72	92
Maryland	0	0
Michigan	14	21
Mississippi	17	26
Montana	5	7
Nebraska	3	3
New Mexico	34	37
New York	0	1
North Dakota	16	16
Ohio	6	6
Oklahoma	99	124
Pennsylvania	5	10

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database

	5-29-89	5-30-88
South Dakota	1	1
Texas	225	266
Offshore	18	19
Inland Waters	2	4
Dist. 1	6	8
Dist. 2	12	10
Dist. 3	25	22
Dist. 4	30	38
Dist. 5	4	7
Dist. 6	35	25
Dist. 7B	7	11
Dist. 7C	15	13
Dist. 8	26	46
Dist. 8A	25	36
Dist. 9	11	16
Dist. 10	9	11
Utah	2	6
West Virginia	14	8
Wyoming	21	36
Others, Nv.-3,Tn.-1, Va.-3	7	5
Total U.S.	**749**	**905**
Cum. Avg. to Date	**778**	**959**
Canada	73	190
Canada-Offshore	0	4
Grand Total	**822**	**1,099**

Rotary rigs from spudding in to total depth

Baker Hughes rig count

	6-26-89	6-27-88
Alabama	14	6
Alaska	9	13
Arkansas	8	11
California	44	69
Land	41	61
Offshore	3	8
Colorado	24	21
Florida	2	2
Illinois	5	3
Indiana	0	0
Kansas	40	39
Kentucky	4	6
Louisiana	136	162
N. Land	12	16
S. Inland Waters	15	22
S. Land	30	34
Offshore	79	90
Maryland	0	0
Michigan	17	19
Mississippi	15	21
Montana	3	5
Nebraska	2	5
New Mexico	41	37
New York	0	1
North Dakota	20	17
Ohio	9	7
Oklahoma	100	127
Pennsylvania	18	16

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database

	6-26-89	6-27-88
South Dakota	0	0
Texas	240	252
Offshore	20	16
Inland Waters	2	3
Dist. 1	6	5
Dist. 2	12	8
Dist. 3	32	23
Dist. 4	29	35
Dist. 5	4	8
Dist. 6	35	22
Dist. 7B	11	9
Dist. 7C	10	16
Dist. 8	33	46
Dist. 8A	21	27
Dist. 9	13	20
Dist. 10	12	14
Utah	5	5
West Virginia	18	7
Wyoming	28	37
Others, Nv.-4,Tn.-1, Va.-3	8	6
Total U.S.	**810**	**894**
Cum. Avg. to Date	**780**	**949**
Canada	120	196
Canada-Offshore	1	4
Grand Total	**931**	**1,094**

Rotary rigs from spudding in to total depth

Baker Hughes rig count

	7-31-89	8-1-88
Alabama	13	12
Alaska	12	12
Arkansas	11	11
California	51	67
Land	47	59
Offshore	4	8
Colorado	32	25
Florida	2	2
Illinois	5	3
Indiana	0	0
Kansas	43	33
Kentucky	6	6
Louisiana	144	156
N. Land	14	14
S. Inland Waters	21	25
S. Land	28	30
Offshore	81	87
Maryland	0	0
Michigan	21	21
Mississippi	15	16
Montana	5	10
Nebraska	1	2
New Mexico	34	47
New York	0	1
North Dakota	9	15
Ohio	11	7
Oklahoma	112	112
Pennsylvania	20	15

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database

	7-31-89	8-1-88
South Dakota	0	2
Texas	246	240
Offshore	24	18
Inland Waters	2	5
Dist. 1	10	6
Dist. 2	9	7
Dist. 3	25	23
Dist. 4	33	43
Dist. 5	12	13
Dist. 6	46	19
Dist. 7B	8	11
Dist. 7C	10	12
Dist. 8	29	33
Dist. 8A	24	21
Dist. 9	8	17
Dist. 10	6	12
Utah	6	7
West Virginia	21	16
Wyoming	42	47
Others, Nv.-3,Tn.-1, Va. - 3, Wa. - 1	8	9
Total U.S.	**870**	**894**
Cum. Avg. to Date	**789**	**943**
Canada	110	191
Canada-Offshore	2	3
Grand Total	**982**	**1,088**

Rotary rigs from spudding in to total depth

Baker Hughes rig count

	8-28-89	8-29-88
Alabama	9	17
Alaska	13	13
Arkansas	14	13
California	53	66
Land	48	58
Offshore	5	8
Colorado	28	27
Florida	1	0
Illinois	5	3
Indiana	0	0
Kansas	42	35
Kentucky	7	6
Louisiana	143	152
N. Land	21	16
S. Inland Waters	18	24
S. Land	31	30
Offshore	73	82
Maryland	0	0
Michigan	22	17
Mississippi	18	15
Montana	7	12
Nebraska	2	3
New Mexico	31	30
New York	0	1
North Dakota	13	11
Ohio	13	11
Oklahoma	117	130
Pennsylvania	22	19

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database

	8-28-89	8-29-88
South Dakota	1	1
Texas	265	275
Offshore	18	26
Inland Waters	4	2
Dist. 1	7	4
Dist. 2	14	13
Dist. 3	25	24
Dist. 4	37	39
Dist. 5	5	11
Dist. 6	54	30
Dist. 7B	8	12
Dist. 7C	13	11
Dist. 8	34	50
Dist. 8A	21	24
Dist. 9	12	17
Dist. 10	13	12
Utah	6	7
West Virginia	25	18
Wyoming	44	43
Others, Nv.-4,Tn.-1, Va. - 2, Wa. - 1	8	10
Total U.S.	**909**	**935**
Cum. Avg. to Date	**800**	**942**
Canada	98	173
Canada-Offshore	2	3
Grand Total	**1,009**	**1,111**

Rotary rigs from spudding in to total depth

Baker Hughes rig count

	9-25-89	9-26-88
Alabama	18	14
Alaska	10	14
Arkansas	11	8
California	51	60
Land	46	53
Offshore	5	7
Colorado	30	24
Florida	3	0
Illinois	5	3
Indiana	0	0
Kansas	39	38
Kentucky	7	6
Louisiana	134	148
N. Land	14	17
S. Inland Waters	15	17
S. Land	33	34
Offshore	72	80
Maryland	0	0
Michigan	19	15
Mississippi	14	16
Montana	6	10
Nebraska	0	4
New Mexico	33	37
New York	1	2
North Dakota	14	11
Ohio	14	19
Oklahoma	139	113
Pennsylvania	21	23

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database

	9-25-89	9-26-88
South Dakota	2	1
Texas	306	288
Offshore	25	30
Inland Waters	4	2
Dist. 1	8	5
Dist. 2	11	15
Dist. 3	26	25
Dist. 4	48	34
Dist. 5	10	16
Dist. 6	63	38
Dist. 7B	7	17
Dist. 7C	11	17
Dist. 8	46	39
Dist. 8A	25	23
Dist. 9	11	12
Dist. 10	11	15
Utah	10	4
West Virginia	20	20
Wyoming	52	32
Others, Nv.-3,Or.-1, Tn. - 1, Va. - 2, Wa. - 1	8	7
Total U.S.	**967**	**917**
Cum. Avg. to Date	**815**	**941**
Canada	127	272
Canada-Offshore	0	3
Grand Total	**1,094**	**1,192**

Rotary rigs from spudding in to total depth

Baker Hughes rig count

	10-30-89	10-31-88
Alabama	16	18
Alaska	9	12
Arkansas	14	6
California	46	53
Land	40	46
Offshore	6	7
Colorado	41	38
Florida	0	1
Illinois	5	4
Indiana	0	0
Kansas	46	42
Kentucky	4	5
Louisiana	148	146
N. Land	21	13
S. Inland Waters	20	17
S. Land	37	35
Offshore	70	81
Maryland	0	0
Michigan	23	15
Mississippi	13	16
Montana	7	8
Nebraska	0	1
New Mexico	54	44
New York	0	0
North Dakota	21	11
Ohio	14	13
Oklahoma	132	107
Pennsylvania	19	26

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database

	10-30-89	10-31-88
South Dakota	1	0
Texas	320	297
Offshore	23	29
Inland Waters	0	1
Dist. 1	11	5
Dist. 2	13	17
Dist. 3	27	25
Dist. 4	46	33
Dist. 5	12	12
Dist. 6	58	45
Dist. 7B	8	9
Dist. 7C	25	21
Dist. 8	53	33
Dist. 8A	17	24
Dist. 9	15	19
Dist. 10	12	24
Utah	7	3
West Virginia	19	17
Wyoming	45	33
Others, Nv.-2,Or.-1, Tn. - 1, Va. - 2	6	7
Total U.S.	**1,010**	**923**
Cum. Avg. to Date	**835**	**939**
Canada	158	151
Canada-Offshore	0	2
Grand Total	**1,168**	**1,076**

Oil Rigs — 516 **Gas Rigs — 482**
Rotary rigs from spudding in to total depth

Baker Hughes rig count

	11-27-89	11-28-88
Alabama	16	17
Alaska	12	11
Arkansas	20	8
California	49	50
Land	44	43
Offshore	5	7
Colorado	41	30
Florida	1	1
Illinois	6	4
Indiana	0	0
Kansas	50	43
Kentucky	5	8
Louisiana	163	165
N. Land	20	16
S. Inland Waters	17	17
S. Land	39	41
Offshore	87	91
Maryland	0	0
Michigan	21	11
Mississippi	12	13
Montana	4	8
Nebraska	2	2
New Mexico	51	36
New York	0	1
North Dakota	21	13
Ohio	21	11
Oklahoma	131	123
Pennsylvania	15	30

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database

	11-27-89	11-28-88
South Dakota	1	1
Texas	320	272
Offshore	23	28
Inland Waters	0	0
Dist. 1	14	2
Dist. 2	9	13
Dist. 3	28	24
Dist. 4	42	32
Dist. 5	15	11
Dist. 6	55	40
Dist. 7B	16	10
Dist. 7C	21	17
Dist. 8	57	45
Dist. 8A	21	22
Dist. 9	12	16
Dist. 10	7	12
Utah	10	4
West Virginia	16	16
Wyoming	44	25
Others, Nv.-1,Or.-1, Tn. - 1, Va. - 2	5	8
Total U.S.	**1,037**	**911**
Cum. Avg. to Date	**852**	**937**
Canada	123	107
Canada-Offshore	1	2
Grand Total	**1,161**	**1,020**

Oil Rigs — 516 **Gas Rigs — 514**
Rotary rigs from spudding in to total depth

Baker Hughes rig count

	12-25-89	12-26-88
Alabama	15	11
Alaska	10	12
Arkansas	11	3
California	46	49
Land	40	42
Offshore	6	7
Colorado	32	27
Florida	2	2
Illinois	4	4
Indiana	0	0
Kansas	45	44
Kentucky	7	9
Louisiana	172	164
N. Land	24	17
S. Inland Waters	18	15
S. Land	50	41
Offshore	80	91
Maryland	0	0
Michigan	24	10
Mississippi	13	26
Montana	7	6
Nebraska	2	2
New Mexico	47	36
New York	0	1
North Dakota	22	9
Ohio	16	23
Oklahoma	146	137
Pennsylvania	13	31

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database

	12-25-89	12-26-88
South Dakota	1	1
Texas	336	268
Offshore	23	21
Inland Waters	0	1
Dist. 1	20	2
Dist. 2	17	11
Dist. 3	28	36
Dist. 4	48	41
Dist. 5	14	9
Dist. 6	47	30
Dist. 7B	13	7
Dist. 7C	22	15
Dist. 8	48	35
Dist. 8A	25	21
Dist. 9	22	22
Dist. 10	9	17
Utah	7	3
West Virginia	22	18
Wyoming	55	36
Others, Hi.-1,Or.-1, Tn. - 3, Va. - 1	6	8
Total U.S.	**1,061**	**940**
Cum. Avg. to Date	**868**	**936**
Canada	180	118
Canada-Offshore	1	2
Grand Total	**1,242**	**1,060**

Oil Rigs — 548 **Gas Rigs — 505**
Rotary rigs from spudding in to total depth

Smith rig count

	1-27-89		1-29-88	
Proposed depth (feet)	Rig count	% footage*	Rig count	% footage*
0- 2,500	28	53.6	24	29.2
2,501- 5,000	112	90.2	187	78.1
5,001- 7,500	141	76.6	204	76.0
7,501-10,000	191	51.8	224	67.0
10,001-12,500	142	38.0	190	46.8
12,501-15,000	102	25.5	136	27.9
15,001-17,500	49	34.7	78	28.2
17,501-20,000	26	30.8	39	30.8
20,001-over	8	12.5	8	–
Total	**799**	**53.7**	**1,090**	**56.8**
INLAND	15		27	
LAND	675		927	
OFFSHORE	109		136	

* Rigs employed under footage contracts.
Definitions, see OGJ 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Database.

Smith rig count

	4-28-89		4-29-88	
Proposed depth (feet)	Rig count	% footage*	Rig count	% footage*
0- 2,500	29	37.9	38	34.2
2,501- 5,000	128	89.8	154	77.3
5,001- 7,500	159	77.4	174	72.4
7,501-10,000	210	59.5	225	63.6
10,001-12,500	151	42.4	178	39.9
12,501-15,000	116	34.5	121	38.8
15,001-17,500	40	35.0	83	15.7
17,501-20,000	28	32.1	36	33.3
20,001-over	6	–	8	–
Total	**867**	**57.8**	**1,017**	**53.5**
INLAND	17		28	
LAND	747		854	
OFFSHORE	103		135	

* Rigs employed under footage contracts.
Definitions, see OGJ, Mar. 19, 1984, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Database.

Smith rig count

	7-28-89		7-29-88	
Proposed depth (feet)	Rig count	% footage*	Rig count	% footage*
0- 2,500	37	40.5	29	41.4
2,501- 5,000	153	93.5	169	82.8
5,001- 7,500	191	80.6	201	74.1
7,501-10,000	235	60.4	221	56.1
10,001-12,500	157	45.2	214	35.5
12,501-15,000	127	26.8	105	31.4
15,001-17,500	46	34.8	71	19.7
17,501-20,000	24	25.0	26	26.9
20,001-over	8	–	10	10.0
Total	**978**	**58.4**	**1,046**	**53.2**
INLAND	25		24	
LAND	831		879	
OFFSHORE	122		143	

* Rigs employed under footage contracts.
Definitions, see OGJ 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Database.

Smith rig count

	10-27-89		10-28-88	
Proposed depth (feet)	Rig count	% footage*	Rig count	% footage*
0- 2,500	40	52.5	34	64.7
2,501- 5,000	199	84.4	167	86.8
5,001- 7,500	220	75.0	177	80.2
7,501-10,000	280	62.9	248	64.5
10,001-12,500	204	39.7	178	41.6
12,501-15,000	131	32.1	105	34.3
15,001-17,500	54	18.5	68	30.9
17,501-20,000	28	28.6	27	33.3
20,001-over	8	—	6	16.7
Total	**1,164**	**57.8**	**1,010**	**60.4**
INLAND	21		12	
LAND	1,013		873	
OFFSHORE	130		125	

* Rigs employed under footage contracts.
Definitions, see OGJ 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Database.

Smith rig count

	2-24-89		2-26-88	
Proposed depth (feet)	Rig count	% footage*	Rig count	% footage*
0- 2,500	19	26.3	35	31.4
2,501- 5,000	123	82.1	184	82.6
5,001- 7,500	148	79.1	202	74.8
7,501-10,000	170	58.2	230	57.0
10,001-12,500	155	38.1	176	44.9
12,501-15,000	115	23.5	122	27.0
15,001-17,500	47	29.8	95	28.4
17,501-20,000	24	33.3	33	30.3
20,001-over	8	–	9	–
Total	**809**	**53.2**	**1,086**	**54.7**
INLAND	20		27	
LAND	680		917	
OFFSHORE	109		142	

* Rigs employed under footage contracts.
Definitions, see OGJ 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Database.

Smith rig count

	5-26-89		5-27-88	
Proposed depth (feet)	Rig count	% footage*	Rig count	% footage*
0- 2,500	31	45.2	36	27.8
2,501- 5,000	142	80.3	158	79.7
5,001- 7,500	150	76.0	178	74.2
7,501-10,000	185	51.9	221	58.4
10,001-12,500	154	42.2	181	38.1
12,501-15,000	109	33.0	127	36.2
15,001-17,500	38	28.9	70	12.9
17,501-20,000	21	28.6	35	28.6
20,001-over	6	–	9	–
Total	**836**	**54.5**	**1,015**	**52.3**
INLAND	21		27	
LAND	712		861	
OFFSHORE	103		127	

* Rigs employed under footage contracts.
Definitions, see OGJ 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Database.

Smith rig count

	8-25-89		8-26-88	
Proposed depth (feet)	Rig count	% footage*	Rig count	% footage*
0- 2,500	38	39.5	28	53.6
2,501- 5,000	177	86.4	179	82.7
5,001- 7,500	201	76.6	209	71.3
7,501-10,000	255	60.8	234	62.4
10,001-12,500	173	45.7	199	33.7
12,501-15,000	121	31.4	106	33.0
15,001-17,500	50	20.0	64	29.7
17,501-20,000	23	17.4	26	19.2
20,001-over	6	–	7	14.3
Total	**1,044**	**58.2**	**1,052**	**55.6**
INLAND	24		25	
LAND	904		894	
OFFSHORE	116		133	

* Rigs employed under footage contracts.
Definitions, see OGJ 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Database.

Smith rig count

	11-24-89		11-25-88	
Proposed depth (feet)	Rig count	% footage*	Rig count	% footage*
0- 2,500	28	28.6	24	50.0
2,501- 5,000	180	86.7	141	90.8
5,001- 7,500	194	76.3	170	81.8
7,501-10,000	323	62.8	239	62.3
10,001-12,500	202	43.1	180	36.7
12,501-15,000	159	32.7	97	32.0
15,001-17,500	56	16.1	62	29.0
17,501-20,000	26	26.9	27	37.0
20,001-over	6	—	9	11.1
Total	**1,174**	**57.1**	**949**	**58.4**
INLAND	22		22	
LAND	1,016		801	
OFFSHORE	136		126	

* Rigs employed under footage contracts.
Definitions, see OGJ 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Database.

Smith rig count

	3-31-89		4-1-88	
Proposed depth (feet)	Rig count	% footage*	Rig count	% footage*
0- 2,500	18	22.2	34	26.5
2,501- 5,000	115	83.5	159	83.6
5,001- 7,500	157	79.0	189	73.5
7,501-10,000	193	63.2	247	61.5
10,001-12,500	153	43.1	192	44.8
12,501-15,000	123	27.6	130	32.3
15,001-17,500	48	27.1	82	20.7
17,501-20,000	27	25.9	36	33.3
20,001-over	7	–	8	12.5
Total	**841**	**55.4**	**1,077**	**54.9**
INLAND	16		31	
LAND	716		906	
OFFSHORE	109		140	

* Rigs employed under footage contracts.
Definitions, see OGJ 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Database.

Smith rig count

	6-23-89		6-24-88	
Proposed depth (feet)	Rig count	% footage*	Rig count	% footage*
0- 2,500	35	42.9	37	51.4
2,501- 5,000	132	87.1	176	77.8
5,001- 7,500	175	74.3	192	71.9
7,501-10,000	212	58.0	242	61.2
10,001-12,500	136	37.5	184	37.0
12,501-15,000	113	28.3	124	33.9
15,001-17,500	43	30.2	66	15.2
17,501-20,000	24	29.2	33	27.3
20,001-over	7	–	8	12.5
Total	**877**	**55.4**	**1,082**	**53.9**
INLAND	22		21	
LAND	743		903	
OFFSHORE	112		138	

* Rigs employed under footage contracts.
Definitions, see OGJ 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Database.

Smith rig count

	9-29-89		9-30-88	
Proposed depth (feet)	Rig count	% footage*	Rig count	% footage*
0- 2,500	36	47.2	28	46.4
2,501- 5,000	175	87.4	172	86.6
5,001- 7,500	204	72.1	182	73.6
7,501-10,000	272	64.0	244	66.4
10,001-12,500	172	47.1	195	42.6
12,501-15,000	146	33.6	106	34.9
15,001-17,500	46	21.7	68	26.5
17,501-20,000	28	17.9	26	26.9
20,001-over	6	–	6	16.7
Total	**1,085**	**58.6**	**1,027**	**58.8**
INLAND	22		15	
LAND	952		879	
OFFSHORE	111		133	

* Rigs employed under footage contracts.
Definitions, see OGJ 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Database.

Smith rig count

	12-15-89		12-16-88	
Proposed depth (feet)	Rig count	% footage*	Rig count	% footage*
0- 2,500	30	53.3	20	55.0
2,501- 5,000	192	86.5	173	85.5
5,001- 7,500	233	73.4	191	83.8
7,501-10,000	326	57.4	221	62.0
10,001-12,500	202	42.6	182	39.6
12,501-15,000	157	33.8	104	29.8
15,001-17,500	62	22.6	59	27.1
17,501-20,000	25	24.0	26	34.6
20,001-over	7	—	9	11.1
Total	**1,234**	**56.8**	**985**	**59.4**
INLAND	23		20	
LAND	1,074		846	
OFFSHORE	137		119	

* Rigs employed under footage contracts.
Definitions, see OGJ 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Database.

OGJ production report

Crude oil and lease condensate
(1,000 b/d)

	1-27-89*	1-29-88†
Alabama	55	59
Alaska	2,035	1,999
California	1,058	1,071
Colorado	84	79
Florida	20	23
Illinois	62	66
Kansas	158	153
Louisiana	1,150	1,248
Michigan	65	67
Mississippi	73	76

	1-27-89*	1-29-88†
Montana	63	65
New Mexico	190	192
North Dakota	106	108
Oklahoma	340	353
Texas	2,010	2,105
Utah	93	94
Wyoming	310	321
All others	141	137
Total	**8,013**	**8,216**

*OGJ estimate †Revised

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database

OGJ production report

Crude oil and lease condensate
(1,000 b/d)

	2-24-89*	2-26-88†
Alabama	55	59
Alaska	2,015	2,070
California	1,057	1,068
Colorado	84	86
Florida	21	22
Illinois	62	69
Kansas	158	165
Louisiana	1,154	1,228
Michigan	65	68
Mississippi	72	76

	2-24-89*	2-26-88†
Montana	63	66
New Mexico	191	199
North Dakota	103	109
Oklahoma	340	378
Texas	2,007	2,116
Utah	93	95
Wyoming	310	321
All others	138	141
Total	**7,988**	**8,336**

*OGJ estimate †Revised

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database

OGJ production report

Crude oil and lease condensate
(1,000 b/d)

	3-31-89*	4-1-88†
Alabama	55	56
Alaska	850	2,086
California	1,056	1,069
Colorado	84	89
Florida	21	22
Illinois	62	65
Kansas	158	166
Louisiana	1,156	1,248
Michigan	65	68
Mississippi	74	75

	3-31-89*	4-1-88†
Montana	63	66
New Mexico	197	198
North Dakota	102	109
Oklahoma	340	361
Texas	2,012	2,108
Utah	92	92
Wyoming	307	317
All others	137	143
Total	**6,831**	**8,338**

*OGJ estimate †Revised

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database

OGJ production report

Crude oil and lease condensate
(1,000 b/d)

	4-28-89*	4-29-88†
Alabama	55	56
Alaska	1,990	2,029
California	1,050	1,070
Colorado	84	91
Florida	21	21
Illinois	62	66
Kansas	160	165
Louisiana	1,154	1,221
Michigan	65	67
Mississippi	74	75

	4-28-89*	4-29-88†
Montana	63	63
New Mexico	198	194
North Dakota	102	110
Oklahoma	340	357
Texas	2,020	2,090
Utah	90	94
Wyoming	303	322
All others	136	145
Total	**7,967**	**8,236**

*OGJ estimate †Revised

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database

OGJ production report

Crude oil and lease condensate
(1,000 b/d)

	5-26-89*	5-27-88†
Alabama	55	52
Alaska	1,920	2,016
California	1,015	1,069
Colorado	85	91
Florida	21	22
Illinois	63	64
Kansas	159	158
Louisiana	1,145	1,236
Michigan	65	64
Mississippi	74	74

	5-26-89*	5-27-88†
Montana	62	65
New Mexico	194	190
North Dakota	103	110
Oklahoma	344	362
Texas	2,015	2,071
Utah	86	96
Wyoming	300	317
All others	136	150
Total	**7,842**	**8,207**

*OGJ estimate †Revised

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database

OGJ production report

Crude oil and lease condensate
(1,000 b/d)

	6-30-89*	7-1-88†
Alabama	57	57
Alaska	1,974	1,984
California	1,012	1,066
Colorado	85	90
Florida	20	22
Illinois	63	66
Kansas	154	168
Louisiana	1,142	1,211
Michigan	63	65
Mississippi	74	73

	6-30-89*	7-1-88†
Montana	62	64
New Mexico	189	193
North Dakota	103	110
Oklahoma	346	357
Texas	1,978	2,059
Utah	83	92
Wyoming	300	312
All others	136	149
Total	**7,841**	**8,138**

*OGJ estimate †Revised

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database

OGJ production report

Crude oil and lease condensate
(1,000 b/d)

	7-28-89*	7-29-88†
Alabama	56	59
Alaska	1,875	1,960
California	1,005	1,058
Colorado	85	90
Florida	20	22
Illinois	63	59
Kansas	148	155
Louisiana	1,137	1,219
Michigan	60	62
Mississippi	73	74

	7-28-89*	7-29-88†
Montana	58	64
New Mexico	189	191
North Dakota	102	108
Oklahoma	335	342
Texas	1,960	2,040
Utah	79	89
Wyoming	295	311
All others	129	137
Total	**7,669**	**8,040**

*OGJ estimate †Revised

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database

OGJ production report

Crude oil and lease condensate
(1,000 b/d)

	8-25-89*	8-26-88†
Alabama	56	57
Alaska	1,860	2,009
California	1,006	1,056
Colorado	85	90
Florida	20	22
Illinois	59	64
Kansas	148	163
Louisiana	1,135	1,197
Michigan	60	61
Mississippi	73	81

	8-25-89*	8-26-88†
Montana	56	64
New Mexico	187	194
North Dakota	101	107
Oklahoma	328	349
Texas	1,950	2,035
Utah	78	89
Wyoming	295	302
All others	129	139
Total	**7,626**	**8,079**

*OGJ estimate †Revised

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database

OGJ production report

Crude oil and lease condensate
(1,000 b/d)

	9-29-89*	9-30-88†
Alabama	57	58
Alaska	1,875	2,019
California	1,009	1,047
Colorado	84	89
Florida	20	21
Illinois	60	62
Kansas	146	158
Louisiana	1,130	1,047
Michigan	58	63
Mississippi	73	75

	9-29-89*	9-30-88†
Montana	56	63
New Mexico	185	193
North Dakota	100	106
Oklahoma	325	343
Texas	1,946	2,019
Utah	78	88
Wyoming	295	302
All others	130	142
Total	**7,627**	**7,896**

*OGJ estimate †Revised

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database

OGJ production report

Crude oil and lease condensate
(1,000 b/d)

	10-27-89*	10-28-88†
Alabama	57	55
Alaska	1,883	2,010
California	1,012	1,049
Colorado	84	89
Florida	20	18
Illinois	60	58
Kansas	146	154
Louisiana	1,120	1,193
Michigan	58	61
Mississippi	74	76

	10-27-89*	10-28-88†
Montana	56	62
New Mexico	185	193
North Dakota	100	106
Oklahoma	329	335
Texas	1,948	2,034
Utah	78	88
Wyoming	295	303
All others	132	139
Total	**7,637**	**8,023**

*OGJ estimate †Revised

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database

OGJ production report

Crude oil and lease condensate
(1,000 b/d)

	11-24-89*	11-25-88†
Alabama	57	56
Alaska	1,886	2,027
California	1,010	1,026
Colorado	84	88
Florida	21	19
Illinois	60	59
Kansas	146	152
Louisiana	1,115	1,222
Michigan	58	61
Mississippi	76	75

	11-24-89*	11-25-88†
Montana	56	61
New Mexico	186	192
North Dakota	100	105
Oklahoma	326	337
Texas	1,932	2,024
Utah	78	85
Wyoming	295	297
All others	132	137
Total	**7,818**	**8,023**

*OGJ estimate †Revised

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database

OGJ production report

Crude oil and lease condensate
(1,000 b/d)

	12-22-89*	12-23-88†
Alabama	55	56
Alaska	1,895	2,002
California	1,002	1,011
Colorado	82	86
Florida	21	19
Illinois	54	58
Kansas	144	155
Louisiana	1,105	1,211
Michigan	58	61
Mississippi	76	75

	12-22-89*	12-23-88†
Montana	56	60
New Mexico	184	191
North Dakota	99	103
Oklahoma	316	343
Texas	1,915	2,011
Utah	76	83
Wyoming	295	295
All others	130	138
Total	**7,563**	**7,958**

*OGJ estimate †Revised

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database

API refinery report—January 27, 1989

District	Refinery operations (Thousands of barrels daily)					Refinery output (Thousands of barrels daily)						
	Total refinery input	Crude runs	Input to crude stills	Operable capacity	% operated	Motor gasoline Total	Motor gasoline Leaded*	Motor gasoline Unleaded*	Jet fuel Naphtha	Jet fuel Kero	Fuel oils Distillate	Fuel oils Residual
East coast	1,550	1,231	1,231	1,380	89.2	735	57	678	32	85	343	155
App. Dist. 1	101	90	90	107	84.1	47	8	39	—	—	33	4
Dist. 1 total	**1,651**	**1,321**	**1,321**	**1,487**	**88.8**	**782**	**65**	**717**	**32**	**85**	**376**	**159**
Ind., Ill., Ky.	2,269	2,041	2,048	2,254	90.9	1,202	72	1,130	8	109	489	91
Minn., Wis., Dak.	328	319	319	312	102.2	183	31	152	3	17	81	9
Okla., Kan., Mo.	692	619	623	718	86.8	325	65	260	15	54	155	9
Dist. 2 total	**3,289**	**2,979**	**2,990**	**3,284**	**91.0**	**1,710**	**168**	**1,542**	**26**	**180**	**725**	**109**
Inland Texas	584	503	511	569	89.8	300	79	221	27	50	115	16
Texas Gulf coast	3,228	2,806	2,806	3,565	78.7	1,488	150	1,338	26	303	556	185
La. Gulf Coast	2,756	2,553	2,616	2,908	90.0	1,199	201	998	24	371	494	117
N. La. and Ark.	197	157	164	252	65.1	57	9	48	7	2	59	11
New Mexico	90	72	71	76	93.4	40	11	29	9	1	20	—
Dist. 3 total	**6,855**	**6,091**	**6,168**	**7,370**	**83.7**	**3,084**	**450**	**2,634**	**93**	**727**	**1,244**	**329**
Dist. 4 total	**456**	**405**	**419**	**535**	**78.3**	**232**	**50**	**182**	**11**	**22**	**114**	**12**
Dist. 5 total	**2,666**	**2,594**	**2,623**	**3,231**	**81.2**	**1,140**	**245**	**895**	**37**	**355**	**446**	**340**
January 27, 1989	**14,917**	**13,390**	**13,521**	**15,907**	**85.0**	**6,948**	**978**	**5,970**	**199**	**1,369**	**2,905**	**949**
January 20, 1989†	**14,906**	**13,524**	**13,668**	**15,907**	**85.9**	**7,169**	**1,196**	**5,973**	**177**	**1,371**	**3,108**	**1,004**
January 29, 1988	**14,212**	**13,098**	**13,198**	**15,697**	**84.1**	**6,749**	**1,297**	**5,452**	**199**	**1,239**	**3,038**	**1,014**

*Included in total motor gasoline. †Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database

API refinery report—February 24, 1989

District	Refinery operations (Thousands of barrels daily)					Refinery output (Thousands of barrels daily)						
	Total refinery input	Crude runs	Input to crude stills	Operable capacity	% operated	Motor gasoline Total	Motor gasoline Leaded*	Motor gasoline Unleaded*	Jet fuel Naphtha	Jet fuel Kero	Fuel oils Distillate	Fuel oils Residual
East coast	1,404	1,165	1,165	1,380	84.4	739	24	715	30	64	313	125
App. Dist. 1	111	103	103	107	96.3	42	10	32	—	—	35	2
Dist. 1 total	**1,515**	**1,268**	**1,268**	**1,487**	**85.3**	**781**	**34**	**747**	**30**	**64**	**348**	**127**
Ind., Ill., Ky.	2,117	1,911	1,911	2,254	84.8	1,171	68	1,103	9	134	453	60
Minn., Wis., Dak.	322	312	312	312	100.0	166	19	147	—	17	85	11
Okla., Kan., Mo.	715	629	629	718	87.6	396	101	295	—	54	167	12
Dist. 2 total	**3,154**	**2,852**	**2,852**	**3,284**	**86.8**	**1,733**	**188**	**1,545**	**9**	**205**	**705**	**83**
Inland Texas	592	520	523	569	91.9	259	50	209	29	47	124	22
Texas Gulf coast	2,967	2,432	2,451	3,565	68.8	1,408	143	1,265	34	285	522	169
La. Gulf Coast	2,717	2,569	2,593	2,908	89.2	1,063	143	930	31	317	569	146
N. La. and Ark.	194	180	180	252	71.4	58	8	50	10	4	53	13
New Mexico	62	41	40	76	52.6	23	8	15	2	2	11	—
Dist. 3 total	**6,532**	**5,742**	**5,787**	**7,370**	**78.5**	**2,811**	**352**	**2,459**	**106**	**655**	**1,279**	**350**
Dist. 4 total	**424**	**404**	**408**	**535**	**76.3**	**217**	**62**	**155**	**10**	**25**	**101**	**14**
Dist. 5 total	**2,556**	**2,433**	**2,508**	**3,231**	**77.6**	**1,063**	**272**	**791**	**57**	**297**	**465**	**369**
February 24, 1989	**14,181**	**12,699**	**12,823**	**15,907**	**80.6**	**6,605**	**908**	**5,697**	**212**	**1,246**	**2,898**	**943**
February 17, 1989†	**14,500**	**12,933**	**13,074**	**15,907**	**82.2**	**6,582**	**904**	**5,678**	**201**	**1,199**	**2,812**	**946**
February 26, 1988	**14,112**	**12,676**	**12,774**	**15,697**	**81.4**	**6,581**	**1,204**	**5,377**	**191**	**1,197**	**2,527**	**970**

*Included in total motor gasoline. †Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database

API refinery report—March 31, 1989

District	Refinery operations (Thousands of barrels daily)					Refinery output (Thousands of barrels daily)						
	Total refinery input	Crude runs	Input to crude stills	Operable capacity	% operated	Motor gasoline Total	Motor gasoline Leaded*	Motor gasoline Unleaded*	Jet fuel Naphtha	Jet fuel Kero	Fuel oils Distillate	Fuel oils Residual
East coast	1,373	1,214	1,214	1,380	88.0	599	14	585	14	53	271	153
App. Dist. 1	113	105	105	107	98.1	42	8	34	—	—	34	3
Dist. 1 total	**1,486**	**1,319**	**1,319**	**1,487**	**88.7**	**641**	**22**	**619**	**14**	**53**	**305**	**156**
Ind., Ill., Ky.	2,180	1,939	1,955	2,254	86.7	1,125	44	1,081	1	99	465	65
Minn., Wis., Dak.	337	324	325	312	104.2	165	27	138	1	26	88	10
Okla., Kan., Mo.	711	624	632	718	88.0	310	70	240	7	43	163	2
Dist. 2 total	**3,228**	**2,887**	**2,912**	**3,284**	**88.7**	**1,600**	**141**	**1,459**	**9**	**168**	**716**	**77**
Inland Texas	585	522	534	569	93.8	277	62	215	20	47	101	13
Texas Gulf coast	3,598	3,083	3,131	3,565	87.8	1,540	111	1,429	30	336	611	184
La. Gulf Coast	2,603	2,427	2,455	2,908	84.4	1,263	79	1,184	25	287	438	127
N. La. and Ark.	194	171	175	252	69.4	62	14	48	5	4	49	10
New Mexico	92	72	72	76	94.7	43	11	32	6	3	19	—
Dist. 3 total	**7,072**	**6,275**	**6,367**	**7,370**	**86.4**	**3,185**	**277**	**2,908**	**86**	**677**	**1,218**	**334**
Dist. 4 total	**433**	**401**	**409**	**535**	**76.4**	**220**	**76**	**144**	**17**	**24**	**124**	**10**
Dist. 5 total	**2,598**	**2,581**	**2,598**	**3,231**	**80.4**	**973**	**217**	**756**	**72**	**309**	**394**	**355**
March 31, 1989	**14,817**	**13,463**	**13,605**	**15,907**	**85.5**	**6,619**	**733**	**5,886**	**198**	**1,231**	**2,757**	**932**
March 24, 1989†	**14,168**	**12,748**	**12,938**	**15,907**	**81.3**	**6,442**	**855**	**5,587**	**224**	**1,178**	**2,679**	**951**
April 1, 1988	**14,427**	**13,059**	**13,208**	**15,697**	**84.1**	**6,919**	**1,483**	**5,436**	**205**	**1,191**	**2,787**	**911**

*Included in total motor gasoline. †Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database

API refinery report—April 28, 1989

	Refinery operations (Thousands of barrels daily)					Refinery output (Thousands of barrels daily)						
						Motor gasoline			Jet fuel		Fuel oils	
District	Total refinery input	Crude runs	Input to crude stills	Operable capacity	% operated	Total	Leaded*	Unleaded*	Naphtha	Kero	Distillate	Residual
East coast	1,215	954	966	1,380	70.0	637	9	628	3	47	252	83
App. Dist. 1	109	106	106	107	99.1	41	5	36	—	4	31	4
Dist. 1 total	**1,324**	**1,060**	**1,072**	**1,487**	**72.1**	**678**	**14**	**664**	**3**	**51**	**283**	**87**
Ind., Ill., Ky.	2,007	1,843	1,843	2,254	81.8	1,113	63	1,050	13	96	424	70
Minn., Wis., Dak.	244	236	236	312	75.6	151	21	130	1	10	69	7
Okla., Kan., Mo.	626	549	551	718	76.7	386	97	289	10	30	144	3
Dist. 2 total	**2,877**	**2,628**	**2,630**	**3,284**	**80.1**	**1,650**	**181**	**1,469**	**24**	**136**	**637**	**80**
Inland Texas	538	503	507	569	89.1	267	62	205	27	34	155	16
Texas Gulf Coast	3,616	3,149	3,155	3,565	88.5	1,656	121	1,535	34	250	616	176
La. Gulf Coast	2,586	2,439	2,483	2,908	85.4	1,238	71	1,167	28	260	478	142
N. La. and Ark.	170	167	167	252	66.3	50	5	45	6	5	51	8
New Mexico	67	74	74	76	97.4	50	15	35	6	2	20	—
Dist. 3 total	**6,977**	**6,332**	**6,386**	**7,370**	**86.6**	**3,261**	**274**	**2,987**	**101**	**551**	**1,320**	**342**
Dist. 4 total	**380**	**377**	**380**	**535**	**71.0**	**213**	**69**	**144**	**9**	**14**	**120**	**12**
Dist. 5 total	**2,720**	**2,706**	**2,786**	**3,231**	**86.2**	**1,173**	**289**	**884**	**54**	**287**	**434**	**408**
April 28, 1989	**14,278**	**13,103**	**13,254**	**15,907**	**83.3**	**6,975**	**827**	**6,148**	**191**	**1,039**	**2,794**	**929**
April 21, 1989†	**13,998**	**13,002**	**13,099**	**15,907**	**82.3**	**6,820**	**823**	**5,997**	**180**	**1,073**	**2,747**	**999**
April 29, 1988	**14,657**	**13,117**	**13,340**	**16,016**	**83.3**	**7,169**	**1,536**	**5,633**	**208**	**1,167**	**2,860**	**1,071**

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*Included in total motor gasoline. †Revised.

Source: American Petroleum Institute

Data available in Oil & Gas Journal Energy Database

API refinery report—May 26, 1989

	Refinery operations (Thousands of barrels daily)					Refinery output (Thousands of barrels daily)						
						Motor gasoline			Jet fuel		Fuel oils	
District	Total refinery input	Crude runs	Input to crude stills	Operable capacity	% operated	Total	Leaded*	Unleaded*	Naphtha	Kero	Distillate	Residual
East coast	1,169	956	971	1,380	70.4	579	13	566	8	43	270	98
App. Dist. 1	91	86	86	107	80.4	22	2	20	—	4	23	2
Dist. 1 total	**1,260**	**1,042**	**1,057**	**1,487**	**71.1**	**601**	**15**	**586**	**8**	**47**	**293**	**100**
Ind., Ill., Ky.	2,014	1,942	1,942	2,254	86.2	1,037	22	1,015	10	104	384	70
Minn., Wis., Dak.	306	297	297	312	95.2	141	8	133	2	19	73	8
Okla., Kan., Mo.	719	686	686	718	95.5	423	88	335	9	34	184	5
Dist. 2 total	**3,039**	**2,925**	**2,925**	**3,284**	**89.1**	**1,601**	**118**	**1,483**	**21**	**157**	**641**	**83**
Inland Texas	540	498	498	569	87.5	302	102	200	20	42	107	26
Texas Gulf coast	3,555	3,246	3,246	3,487	93.1	1,712	85	1,627	38	287	524	211
La. Gulf Coast	2,587	2,511	2,574	2,908	88.5	1,310	144	1,166	26	264	538	132
N. La. and Ark.	198	204	204	252	81.0	66	11	55	5	5	56	22
New Mexico	70	67	67	76	88.2	45	13	32	5	3	16	—
Dist. 3 total	**6,950**	**6,526**	**6,589**	**7,292**	**90.4**	**3,435**	**355**	**3,080**	**94**	**601**	**1,241**	**391**
Dist. 4 total	**503**	**498**	**498**	**535**	**93.1**	**244**	**83**	**161**	**18**	**20**	**124**	**24**
Dist. 5 total	**2,816**	**2,742**	**2,816**	**3,076**	**91.5**	**1,210**	**271**	**939**	**56**	**327**	**455**	**433**
May 26, 1989	**14,568**	**13,733**	**13,885**	**15,674**	**88.6**	**7,091**	**842**	**6,249**	**197**	**1,152**	**2,754**	**1,031**
May 19, 1989†	**14,322**	**13,414**	**13,541**	**15,674**	**86.4**	**6,949**	**877**	**6,072**	**208**	**1,052**	**2,625**	**933**
May 27, 1988	**14,675**	**13,463**	**13,646**	**16,016**	**85.2**	**7,010**	**1,225**	**5,785**	**168**	**1,077**	**2,873**	**914**

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*Included in total motor gasoline. †Revised.

Source: American Petroleum Institute

Data available in Oil & Gas Journal Energy Database

API refinery report—June 23, 1989

	Refinery operations (Thousands of barrels daily)					Refinery output (Thousands of barrels daily)						
						Motor gasoline			Jet fuel		Fuel oils	
District	Total refinery input	Crude runs	Input to crude stills	Operable capacity	% operated	Total	Leaded*	Unleaded*	Naphtha	Kero	Distillate	Residual
East coast	1,417	1,240	1,249	1,380	90.5	596	27	569	15	63	298	117
App. Dist. 1	107	100	100	107	93.5	41	7	34	—	4	31	2
Dist. 1 total	**1,524**	**1,340**	**1,349**	**1,487**	**90.7**	**637**	**34**	**603**	**15**	**67**	**329**	**119**
Ind., Ill., Ky.	2,197	2,094	2,094	2,254	92.9	1,271	47	1,224	12	125	398	42
Minn., Wis., Dak.	333	325	325	312	104.2	159	21	138	—	19	90	10
Okla., Kan., Mo.	742	719	719	718	100.1	449	114	335	7	32	165	5
Dist. 2 total	**3,272**	**3,138**	**3,138**	**3,284**	**95.6**	**1,879**	**182**	**1,697**	**19**	**176**	**653**	**57**
Inland Texas	494	463	467	569	82.1	323	75	248	29	33	117	10
Texas Gulf coast	3,540	3,191	3,191	3,487	91.5	1,717	98	1,619	42	236	589	254
La. Gulf Coast	2,458	2,433	2,456	2,908	84.5	1,183	96	1,087	17	262	572	102
N. La. and Ark.	190	174	174	252	69.0	50	10	40	8	5	48	11
New Mexico	85	78	78	76	102.6	46	13	33	6	1	19	1
Dist. 3 total	**6,767**	**6,339**	**6,366**	**7,292**	**87.3**	**3,319**	**292**	**3,027**	**102**	**537**	**1,345**	**378**
Dist. 4 total	**496**	**487**	**496**	**535**	**92.7**	**250**	**88**	**171**	**14**	**31**	**116**	**11**
Dist. 5 total	**2,771**	**2,690**	**2,771**	**3,076**	**90.1**	**1,252**	**262**	**990**	**56**	**330**	**465**	**365**
June 23, 1989	**14,830**	**13,994**	**14,120**	**15,674**	**90.1**	**7,346**	**858**	**6,488**	**206**	**1,141**	**2,908**	**930**
June 16, 1989†	**14,787**	**13,790**	**13,919**	**15,674**	**88.8**	**7,405**	**908**	**6,497**	**198**	**1,119**	**2,621**	**887**
June 24, 1988	**14,745**	**13,605**	**13,797**	**16,016**	**86.1**	**7,010**	**1,471**	**5,539**	**170**	**1,170**	**2,776**	**900**

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*Included in total motor gasoline. †Revised.

Source: American Petroleum Institute

Data available in Oil & Gas Journal Energy Database

API refinery report—July 28, 1989

	Refinery operations (Thousands of barrels daily)					Refinery output (Thousands of barrels daily)						
						Motor gasoline			Jet fuel		Fuel oils	
District	**Total refinery input**	**Crude runs**	**Input to crude stills**	**Operable capacity**	**% operated**	**Total**	**Leaded***	**Unleaded***	**Naphtha**	**Kero**	**Distillate**	**Residual**
East coast	1,529	1,293	1,306	1,325	98.6	727	14	713	25	66	357	125
App. Dist. 1	96	89	90	109	82.6	50	6	44	—	—	32	2
Dist. 1 total	**1,625**	**1,382**	**1,396**	**1,434**	**97.4**	**777**	**20**	**757**	**25**	**66**	**389**	**127**
Ind., Ill., Ky.	2,200	2,061	2,070	2,198	94.2	1,185	54	1,131	18	133	430	44
Minn., Wis., Dak.	353	340	340	337	100.9	179	21	158	—	21	77	15
Okla., Kan., Mo.	733	703	703	730	96.3	399	89	310	19	52	161	5
Dist. 2 total	**3,286**	**3,104**	**3,113**	**3,265**	**95.3**	**1,763**	**164**	**1,599**	**37**	**206**	**668**	**64**
Inland Texas	557	507	511	555	92.1	365	81	284	27	47	131	9
Texas Gulf coast	3,784	3,298	3,325	3,477	95.6	1,694	88	1,606	35	210	564	376
La. Gulf Coast	2,547	2,428	2,464	2,938	83.9	1,206	64	1,142	12	242	519	98
N. La. and Ark.	199	198	199	247	80.6	57	1	56	6	1	56	6
New Mexico	89	76	81	76	106.6	51	13	38	7	2	22	1
Dist. 3 total	**7,176**	**6,507**	**6,580**	**7,293**	**90.2**	**3,373**	**247**	**3,126**	**87**	**502**	**1,292**	**490**
Dist. 4 total	**525**	**517**	**520**	**546**	**95.2**	**241**	**76**	**165**	**15**	**31**	**124**	**8**
Dist. 5 total	**2,882**	**2,666**	**2,829**	**3,038**	**93.1**	**1,262**	**260**	**1,002**	**63**	**387**	**453**	**365**
July 28, 1989	**15,494**	**14,176**	**14,438**	**15,576**	**92.7**	**7,416**	**767**	**6,649**	**227**	**1,192**	**2,926**	**1,054**
July 21, 1989†	**15,061**	**13,947**	**14,132**	**15,576**	**90.7**	**7,319**	**795**	**6,524**	**247**	**1,207**	**2,774**	**859**
July 29, 1988	**14,788**	**13,799**	**13,929**	**15,917**	**87.5**	**7,229**	**1,282**	**5,947**	**215**	**1,118**	**2,823**	**874**

*Included in total motor gasoline †Revised
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database

API refinery report—August 25, 1989

	Refinery operations (Thousands of barrels daily)					Refinery output (Thousands of barrels daily)						
						Motor gasoline			Jet fuel		Fuel oils	
District	**Total refinery input**	**Crude runs**	**Input to crude stills**	**Operable capacity**	**% operated**	**Total**	**Leaded***	**Unleaded***	**Naphtha**	**Kero**	**Distillate**	**Residual**
East coast	1,503	1,284	1,280	1,325	96.6	678	9	669	13	90	337	101
App. Dist. 1	108	102	102	109	93.6	32	3	29	—	—	39	4
Dist. 1 total	**1,611**	**1,386**	**1,382**	**1,434**	**96.4**	**710**	**12**	**698**	**13**	**90**	**376**	**105**
Ind., Ill., Ky.	2,220	2,073	2,093	2,198	95.2	1,201	38	1,163	26	110	422	60
Minn., Wis., Dak.	333	328	332	337	98.5	156	17	139	2	26	86	18
Okla., Kan., Mo.	791	728	723	730	99.0	421	91	330	7	44	185	5
Dist. 2 total	**3,344**	**3,129**	**3,148**	**3,265**	**96.4**	**1,778**	**146**	**1,632**	**35**	**180**	**693**	**83**
Inland Texas	579	519	519	555	93.5	281	45	236	32	35	124	9
Texas Gulf coast	3,651	3,204	3,235	3,477	93.0	1,410	84	1,326	41	296	701	208
La. Gulf Coast	2,403	2,288	2,316	2,938	78.8	1,161	30	1,131	17	279	457	153
N. La. and Ark.	201	192	193	247	78.1	52	7	45	8	4	50	12
New Mexico	86	73	75	76	98.7	48	16	32	6	—	16	—
Dist. 3 total	**6,920**	**6,276**	**6,338**	**7,293**	**86.9**	**2,952**	**182**	**2,770**	**104**	**614**	**1,348**	**382**
Dist. 4 total	**512**	**503**	**503**	**546**	**92.1**	**260**	**77**	**183**	**16**	**38**	**122**	**17**
Dist. 5 total	**2,838**	**2,731**	**2,828**	**3,038**	**93.1**	**1,255**	**264**	**991**	**54**	**386**	**493**	**380**
August 25, 1989	**15,225**	**14,025**	**14,199**	**15,576**	**91.2**	**6,955**	**681**	**6,274**	**222**	**1,308**	**3,032**	**967**
August 18, 1989†	**14,881**	**13,856**	**14,022**	**15,576**	**90.0**	**7,133**	**717**	**6,416**	**238**	**1,199**	**2,914**	**820**
August 26, 1988	**14,989**	**13,827**	**13,987**	**15,917**	**87.9**	**7,344**	**1,342**	**6,002**	**187**	**1,141**	**2,940**	**829**

*Included in total motor gasoline †Revised
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database

API refinery report—September 29, 1989

	Refinery operations (Thousands of barrels daily)					Refinery output (Thousands of barrels daily)						
						Motor gasoline			Jet fuel		Fuel oils	
District	**Total refinery input**	**Crude runs**	**Input to crude stills**	**Operable capacity**	**% operated**	**Total**	**Leaded***	**Unleaded***	**Naphtha**	**Kero**	**Distillate**	**Residual**
East coast	1,426	1,231	1,252	1,325	94.5	654	8	646	12	99	290	128
App. Dist. 1	89	84	84	109	77.1	37	5	32	—	—	31	3
Dist. 1 total	**1,515**	**1,315**	**1,336**	**1,434**	**93.2**	**691**	**13**	**678**	**12**	**99**	**321**	**131**
Ind., Ill., Ky.	2,055	1,979	1,982	2,198	90.2	1,085	31	1,054	6	78	436	53
Minn., Wis., Dak.	324	312	314	337	93.2	161	31	130	1	7	69	14
Okla., Kan., Mo.	722	686	691	730	94.7	357	76	281	9	57	170	6
Dist. 2 total	**3,101**	**2,977**	**2,987**	**3,265**	**91.5**	**1,603**	**138**	**1,465**	**16**	**142**	**675**	**73**
Inland Texas	593	513	513	555	92.4	293	45	248	29	40	116	11
Texas Gulf Coast	3,659	3,207	3,219	3,477	92.6	1,587	76	1,511	60	288	650	213
La. Gulf Coast	2,571	2,293	2,333	2,938	79.4	1,161	62	1,099	25	263	489	94
N. La. and Ark.	166	152	152	247	61.5	42	—	42	5	4	42	4
New Mexico	87	76	78	76	102.6	42	7	35	7	2	17	1
Dist. 3 total	**7,076**	**6,241**	**6,295**	**7,293**	**86.3**	**3,125**	**190**	**2,935**	**126**	**597**	**1,314**	**323**
Dist. 4 total	**522**	**504**	**504**	**546**	**92.3**	**233**	**66**	**167**	**17**	**25**	**141**	**7**
Dist. 5 total	**2,740**	**2,666**	**2,740**	**3,038**	**90.2**	**1,225**	**226**	**999**	**69**	**305**	**471**	**315**
September 29, 1989	**14,954**	**13,703**	**13,862**	**15,576**	**89.0**	**6,877**	**633**	**6,244**	**240**	**1,168**	**2,922**	**849**
September 22, 1989†	**15,056**	**13,747**	**13,916**	**15,576**	**89.3**	**7,264**	**710**	**6,554**	**213**	**1,247**	**3,008**	**905**
September 30, 1988	**14,556**	**13,362**	**13,522**	**15,917**	**85.0**	**6,834**	**1,184**	**5,650**	**185**	**1,239**	**2,846**	**934**

*Included in total motor gasoline †Revised
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database

API refinery report—October 27, 1989

	Refinery operations (Thousands of barrels daily)					Refinery output (Thousands of barrels daily)						
						Motor gasoline			Jet fuel		Fuel oils	
District	Total refinery input	Crude runs	Input to crude stills	Operable capacity	% operated	Total	Leaded*	Unleaded*	Naphtha	Kero	Distillate	Residual
East coast	1,590	1,319	1,349	1,325	101.8	631	3	628	1	84	342	141
App. Dist. 1	107	99	99	109	90.8	39	4	35	—	—	32	4
Dist. 1 total........	**1,697**	**1,418**	**1,448**	**1,434**	**101.0**	**670**	**7**	**663**	**1**	**84**	**374**	**145**
Ind., Ill., Ky.	1,645	1,629	1,645	2,198	74.8	977	14	963	9	70	398	40
Minn., Wis., Dak.	339	333	335	337	99.4	194	30	164	1	20	92	12
Okla., Kan., Mo.	709	609	616	730	84.4	371	61	310	7	30	197	5
Dist. 2 total........	**2,693**	**2,571**	**2,596**	**3,265**	**79.5**	**1,542**	**105**	**1,437**	**17**	**120**	**687**	**57**
Inland Texas	540	464	483	555	87.0	282	45	237	29	34	107	12
Texas Gulf coast	3,362	3,101	3,135	3,477	90.2	1,545	61	1,484	39	320	647	248
La. Gulf Coast	2,714	2,451	2,507	2,938	85.3	1,211	29	1,182	17	319	523	198
N. La. and Ark.	132	115	118	247	47.8	40	—	40	8	3	40	8
New Mexico	78	74	74	76	97.4	46	16	30	11	1	17	1
Dist. 3 total........	**6,826**	**6,205**	**6,317**	**7,293**	**86.6**	**3,124**	**151**	**2,973**	**104**	**677**	**1,334**	**467**
Dist. 4 total........	**473**	**424**	**432**	**546**	**79.1**	**240**	**64**	**176**	**19**	**29**	**120**	**6**
Dist. 5 total........	**2,745**	**2,652**	**2,690**	**3,038**	**88.5**	**1,211**	**219**	**992**	**47**	**350**	**426**	**348**
October 27, 1989	**14,434**	**13,270**	**13,483**	**15,576**	**86.6**	**6,787**	**546**	**6,241**	**188**	**1,260**	**2,941**	**1,023**
October 20, 1989†	**14,297**	**13,156**	**13,305**	**15,576**	**85.4**	**6,806**	**616**	**6,190**	**191**	**1,337**	**2,724**	**970**
October 28, 1988....	**14,262**	**12,891**	**13,029**	**15,922**	**81.8**	**6,957**	**1,081**	**5,876**	**225**	**1,123**	**2,790**	**877**

*Included in total motor gasoline. †Revised.
Source: American Petroleum Institute.
Data available in Oil & Gas Journal Energy Database

API refinery report—November 24, 1989

	Refinery operations (Thousands of barrels daily)					Refinery output (Thousands of barrels daily)						
						Motor gasoline			Jet fuel		Fuel oils	
District	Total refinery input	Crude runs	Input to crude stills	Operable capacity	% operated	Total	Leaded*	Unleaded*	Naphtha	Kero	Distillate	Residual
East coast	1,370	1,214	1,215	1,325	91.7	701	7	694	17	80	356	134
App. Dist. 1	105	96	98	109	89.9	41	3	38	—	—	35	4
Dist. 1 total........	**1,475**	**1,310**	**1,313**	**1,434**	**91.6**	**742**	**10**	**732**	**17**	**80**	**391**	**138**
Ind., Ill., Ky.	1,913	1,835	1,842	2,198	83.8	1,104	26	1,078	7	83	464	61
Minn., Wis., Dak.	326	321	323	337	95.8	170	13	157	1	20	86	10
Okla., Kan., Mo.	701	633	649	730	88.9	380	61	319	11	50	164	11
Dist. 2 total........	**2,940**	**2,789**	**2,814**	**3,265**	**86.2**	**1,654**	**100**	**1,554**	**19**	**153**	**714**	**82**
Inland Texas	560	485	488	555	87.9	247	25	222	28	35	112	17
Texas Gulf coast	3,298	3,084	3,091	3,477	88.9	1,573	51	1,522	31	357	696	213
La. Gulf Coast	2,601	2,436	2,453	2,938	83.5	1,249	69	1,180	26	320	528	202
N. La. and Ark.	144	128	128	247	51.8	39	2	37	4	—	40	11
New Mexico	82	73	73	76	96.1	47	13	34	9	3	18	1
Dist. 3 total........	**6,685**	**6,206**	**6,233**	**7,293**	**85.5**	**3,155**	**160**	**2,995**	**98**	**715**	**1,394**	**444**
Dist. 4 total........	**494**	**463**	**468**	**546**	**85.7**	**247**	**86**	**161**	**17**	**26**	**132**	**11**
Dist. 5 total........	**2,710**	**2,542**	**2,578**	**3,038**	**84.9**	**1,225**	**238**	**987**	**56**	**337**	**472**	**446**
November 24, 1989	**14,304**	**13,310**	**13,406**	**15,576**	**86.1**	**7,023**	**594**	**6,429**	**207**	**1,311**	**3,103**	**1,121**
November 17, 1989†	**14,562**	**13,344**	**13,402**	**15,576**	**86.0**	**6,962**	**569**	**6,393**	**236**	**1,274**	**2,955**	**1,079**
November 25, 1988.	**14,108**	**12,864**	**13,044**	**15,922**	**81.9**	**6,984**	**1,112**	**5,872**	**249**	**1,097**	**2,901**	**883**

*Included in total motor gasoline. †Revised.
Source: American Petroleum Institute.
Data available in Oil & Gas Journal Energy Database

API refinery report—December 15, 1989

	Refinery operations (Thousands of barrels daily)					Refinery output (Thousands of barrels daily)						
						Motor gasoline			Jet fuel		Fuel oils	
District	Total refinery input	Crude runs	Input to crude stills	Operable capacity	% operated	Total	Leaded*	Unleaded*	Naphtha	Kero	Distillate	Residual
East coast	1,397	1,218	1,236	1,325	93.3	629	5	624	14	90	340	219
App. Dist. 1	116	105	107	124	86.3	37	5	32	—	—	39	4
Dist. 1 total........	**1,513**	**1,323**	**1,343**	**1,449**	**92.7**	**666**	**10**	**656**	**14**	**90**	**379**	**223**
Ind., Ill., Ky.	2,125	2,003	2,011	2,198	91.5	1,239	9	1,230	3	136	519	70
Minn., Wis., Dak.	317	317	317	337	94.1	166	19	147	—	23	81	9
Okla., Kan., Mo.	728	673	687	730	94.1	355	31	324	12	67	184	14
Dist. 2 total........	**3,170**	**2,993**	**3,015**	**3,265**	**92.3**	**1,760**	**59**	**1,701**	**15**	**226**	**784**	**93**
Inland Texas	560	515	516	555	93.0	305	34	271	32	45	135	14
Texas Gulf coast	3,477	3,125	3,134	3,477	90.1	1,636	57	1,579	62	284	756	236
La. Gulf Coast	2,813	2,500	2,532	2,938	86.2	1,175	42	1,133	54	306	679	171
N. La. and Ark.	177	161	161	247	65.2	64	1	63	6	3	55	12
New Mexico	77	74	74	76	97.4	49	15	34	11	3	19	—
Dist. 3 total........	**7,104**	**6,375**	**6,417**	**7,293**	**88.0**	**3,229**	**149**	**3,080**	**165**	**641**	**1,644**	**433**
Dist. 4 total........	**480**	**462**	**464**	**546**	**85.0**	**253**	**69**	**184**	**8**	**26**	**130**	**12**
Dist. 5 total........	**2,778**	**2,573**	**2,662**	**3,038**	**87.6**	**1,260**	**222**	**1,038**	**56**	**346**	**448**	**423**
December 15, 1989	**15,045**	**13,726**	**13,901**	**15,591**	**89.2**	**7,168**	**509**	**6,659**	**258**	**1,329**	**3,385**	**1,184**
December 8, 1989†	**14,910**	**13,660**	**13,813**	**15,591**	**88.6**	**7,231**	**548**	**6,683**	**237**	**1,279**	**3,320**	**1,109**
December 16, 1988.	**14,699**	**13,547**	**13,608**	**15,922**	**85.5**	**7,374**	**1,166**	**6,208**	**220**	**1,258**	**3,079**	**1,068**

*Included in total motor gasoline. †Revised.
Source: American Petroleum Institute.
Data available in Oil & Gas Journal Energy Database

API crude and product stocks

(Thousands of barrels)

		Motor gasoline				Jet fuels		Fuel oils		
	Crude oil	Total	Leaded†	Unleaded†	Blending Comp.†	Naphtha	Kerosine	Distillate	Residual	Unfinished oils
PAD I	14,424	62,531	8,247	50,089	4,195	1,123	8,635	47,290	21,271	11,997
PAD II	70,343	65,722	13,707	43,739	8,276	887	7,690	32,265	3,317	14,614
PAD III	152,459	69,284	9,716	42,315	17,253	2,111	12,849	27,402	12,215	48,171
PAD IV	11,601	8,044	2,159	3,426	2,459	337	627	2,855	653	1,890
PAD I-IV	**248,827**	**205,581**	**33,829**	**139,569**	**32,183**	**4,458**	**29,801**	**109,812**	**37,456**	**76,672**
PAD V	76,809*	34,558	6,435	18,320	9,803	2,009	6,958	10,739	8,116	23,474
January 27, 1989	**325,636***	**240,139**	**40,264**	**157,889**	**41,986**	**6,467**	**36,759**	**120,551**	**45,572**	**100,146**
January 20, 1989§	**326,229**	**236,396**	**40,219**	**154,134**	**42,043**	**6,309**	**36,303**	**120,222**	**45,151**	**99,001**
January 29, 1988	**339,023**	**235,553**	**55,543**	**141,387**	**38,623**	**7,570**	**38,624**	**125,604**	**45,063**	**95,781**

*Includes 23,654 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised.

Source: American Petroleum Institute

Data available in Oil & Gas Journal Energy Database.

API crude and product stocks

(Thousands of barrels)

		Motor gasoline				Jet fuels		Fuel oils		
	Crude oil	Total	Leaded†	Unleaded†	Blending Comp.†	Naphtha	Kerosine	Distillate	Residual	Unfinished oils
PAD I	13,121	66,677	7,835	53,360	5,482	1,172	9,774	40,909	20,045	11,947
PAD II	65,731	68,515	13,754	46,045	8,716	897	7,814	31,264	3,316	13,334
PAD III	155,597	72,257	9,872	43,494	18,891	2,130	13,090	25,718	13,204	51,196
PAD IV	11,811	7,724	2,160	3,313	2,251	320	433	2,536	627	2,318
PAD I-IV	**246,260**	**215,173**	**33,621**	**146,212**	**35,340**	**4,519**	**31,111**	**100,427**	**37,192**	**78,795**
PAD V	77,564*	32,086	6,539	17,164	8,383	1,746	5,099	8,798	7,753	25,001
February 24, 1989	**323,824***	**247,259**	**40,160**	**163,376**	**43,723**	**6,265**	**36,210**	**109,225**	**44,945**	**103,796**
February 17, 1989§	**323,514**	**246,850**	**40,391**	**162,115**	**44,344**	**6,217**	**38,047**	**111,873**	**46,652**	**102,271**
February 26, 1988	**340,222**	**239,835**	**51,660**	**148,342**	**39,833**	**6,707**	**37,725**	**111,765**	**45,506**	**96,572**

*Includes 23,988 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised.

Source: American Petroleum Institute

Data available in Oil & Gas Journal Energy Database.

API crude and product stocks

(Thousands of barrels)

		Motor gasoline				Jet fuels		Fuel oils		
	Crude oil	Total	Leaded†	Unleaded†	Blending Comp.†	Naphtha	Kerosine	Distillate	Residual	Unfinished oils
PAD I	14,114	63,900	6,320	52,958	4,622	945	9,598	32,651	16,310	13,173
PAD II	67,098	65,405	11,233	44,343	9,829	741	8,265	27,444	3,212	15,402
PAD III	155,101	69,175	7,396	45,149	16,630	2,193	13,134	22,630	11,407	53,476
PAD IV	12,040	7,032	2,082	2,781	2,169	288	594	2,097	636	2,185
PAD I-IV	**248,353**	**205,512**	**27,031**	**145,231**	**33,250**	**4,167**	**31,591**	**84,822**	**31,565**	**84,236**
PAD V	76,225*	26,954	5,779	14,154	7,021	1,791	5,355	10,446	9,166	26,136
March 31, 1989	**324,578***	**232,466**	**32,810**	**159,385**	**40,271**	**5,958**	**36,946**	**95,268**	**40,731**	**110,372**
March 24, 1989§	**337,425**	**236,455**	**35,174**	**162,477**	**38,804**	**6,192**	**36,961**	**96,231**	**38,868**	**106,509**
April 1, 1988	**345,832**	**229,766**	**48,505**	**144,337**	**36,924**	**6,669**	**38,873**	**91,258**	**41,992**	**101,446**

*Includes 15,363 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised

Source: American Petroleum Institute

Data available in Oil & Gas Journal Energy Database

API crude and product stocks

(Thousands of barrels)

		Motor gasoline				Jet fuels		Fuel oils		
	Crude oil	Total	Leaded†	Unleaded†	Blending Comp.†	Naphtha	Kerosine	Distillate	Residual	Unfinished oils
PAD I	15,476	62,109	6,084	51,315	4,710	864	11,467	31,299	14,301	13,184
PAD II	67,059	65,392	10,589	45,552	9,251	798	8,002	27,142	2,602	16,004
PAD III	156,928	64,929	7,040	41,854	16,035	2,274	13,381	24,220	14,261	54,096
PAD IV	10,953	6,796	2,108	2,764	1,924	286	716	2,220	625	2,087
PAD I-IV	**250,416**	**199,226**	**25,821**	**141,485**	**31,920**	**4,222**	**33,566**	**84,881**	**31,789**	**85,371**
PAD V	69,787*	26,200	5,478	13,447	7,275	1,711	6,032	11,729	8,398	25,785
April 14, 1989	**320,203***	**225,426**	**31,299**	**154,932**	**39,195**	**5,933**	**39,598**	**96,610**	**40,187**	**111,156**
April 7, 1989§	**325,918**	**227,535**	**32,067**	**155,656**	**39,812**	**5,790**	**38,082**	**96,094**	**42,197**	**109,272**
April 15, 1988	**352,409**	**229,224**	**47,152**	**143,142**	**38,930**	**6,810**	**38,628**	**94,503**	**42,043**	**103,099**

*Includes 13,334 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised

Source: American Petroleum Institute

Data available in Oil & Gas Journal Energy Database

API crude and product stocks

(Thousands of barrels)

		Motor gasoline				Jet fuels		Fuel oils		
	Crude oil	Total	Leaded†	Unleaded†	Blending Comp.†	Naphtha	Kerosine	Distillate	Residual	Unfinished oils
PAD I	15,238	60,242	4,580	50,726	4,936	500	9,922	30,685	14,578	12,639
PAD II	70,700	59,531	8,407	42,218	8,906	971	7,530	26,476	2,972	16,684
PAD III	161,752	67,663	6,249	43,999	17,415	1.975	13,778	25,624	11,839	54,341
PAD IV	12,378	5,814	1,657	2,679	1,478	309	735	2,599	545	2,605
PAD I-IV	**260,068**	**193,250**	**20,893**	**139,622**	**32,735**	**3,755**	**31,965**	**85,384**	**29,934**	**86,269**
PAD V	81,057*	28,780	5,703	15,958	7,119	1,908	6,297	9,960	7,990	26,969
May 26, 1989	**341,125***	**220,030**	**26,596**	**155,580**	**39,854**	**5,663**	**38,262**	**95,344**	**37,924**	**113,238**
May 19, 1989§	**341,679**	**221,342**	**27,646**	**154,293**	**39,403**	**5,788**	**36,697**	**95,406**	**37,956**	**111,051**
May 27, 1988	**360,581**	**224,801**	**45,393**	**143,378**	**36,030**	**6,338**	**38,326**	**99,193**	**42,518**	**108,294**

*Includes 23,011 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API crude and product stocks

(Thousands of barrels)

		Motor gasoline				Jet fuels		Fuel oils		
	Crude oil	Total	Leaded†	Unleaded†	Blending Comp.†	Naphtha	Kerosine	Distillate	Residual	Unfinished oils
PAD I	16,549	62,480	4,356	53,387	4,737	815	9,534	34,714	15,886	13,215
PAD II	72,240	56,598	7,351	41,388	7,859	1,162	8,089	26,998	2,741	15,471
PAD III	158,115	65,300	5,794	41,783	17,723	2,171	13,993	23,449	14,236	55,146
PAD IV	12,176	6,114	1,792	2,660	1,662	250	823	2,719	602	2,691
PAD I-IV	**259,080**	**190,492**	**19,293**	**139,218**	**31,981**	**4,398**	**32,439**	**87,880**	**33,465**	**86,523**
PAD V	83,314*	28,791	5,539	15,571	7,681	1,899	7,331	10,924	8,369	25,332
June 23, 1989	**342,394***	**219,283**	**24,832**	**154,789**	**39,662**	**6,297**	**39,770**	**98,804**	**41,834**	**111,855**
June 16, 1989§	**340,198**	**220,568**	**25,269**	**155,258**	**40,043**	**6,594**	**40,029**	**97,563**	**40,156**	**114,284**
June 24, 1988	**358,226**	**214,957**	**44,019**	**135,441**	**35,497**	**6,573**	**39,454**	**110,024**	**41,084**	**112,343**

*Includes 23,703 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API crude and product stocks

(Thousands of barrels)

		Motor gasoline				Jet fuels		Fuel oils		
	Crude oil	Total	Leaded†	Unleaded†	Blending Comp.†	Naphtha	Kerosine	Distillate	Residual	Unfinished oils
PAD I	14,680	63,247	3,911	54,221	5,115	1,180	10,710	42,325	16,860	12,830
PAD II	69,111	59,695	7,735	43,877	8,083	869	8,584	27,755	2,606	16,020
PAD III	161,710	66,003	5,365	43,419	17,219	1,942	14,418	28,017	14,300	52,426
PAD IV	11,905	6,126	1,714	2,712	1,700	391	796	2,609	624	2,580
PAD I-IV	**257,406**	**195,071**	**18,725**	**144,229**	**32,117**	**4,382**	**34,508**	**100,706**	**34,390**	**83,856**
PAD V	74,015*	30,889	6,167	16,347	8,375	1,919	6,755	10,794	7,796	23,236
July 28, 1989	**331,421***	**225,960**	**24,892**	**160,576**	**40,492**	**6,301**	**41,263**	**111,500**	**42,186**	**107,092**
July 21, 1989§	**330,539**	**221,330**	**25,168**	**156,327**	**39,835**	**6,167**	**40,110**	**109,441**	**42,137**	**107,333**
July 29, 1988	**348,313**	**209,691**	**42,544**	**130,741**	**36,406**	**7,342**	**39,701**	**118,381**	**40,245**	**113,851**

*Includes 17,299 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API crude and product stocks

(Thousands of barrels)

		Motor gasoline				Jet fuels		Fuel oils		
	Crude oil	Total	Leaded†	Unleaded†	Blending Comp.†	Naphtha	Kerosine	Distillate	Residual	Unfinished oils
PAD I	14,237	63,927	3,405	55,744	4,778	948	10,734	48,029	17,370	13,230
PAD II	69,234	58,977	8,016	42,507	8,454	974	9,058	28,785	2,779	16,821
PAD III	168,224	63,254	4,685	41,672	16,897	2,231	15,066	26,718	14,384	49,768
PAD IV	12,301	5,977	1,799	2,439	1,739	355	738	2,639	627	2,279
PAD I-IV	**263,996**	**192,135**	**17,905**	**142,362**	**31,868**	**4,508**	**35,596**	**106,171**	**35,160**	**82,098**
PAD V	73,320*	31,346	6,141	17,513	7,692	1,592	6,058	10,113	7,303	23,816
August 25, 1989	**337,316***	**223,481**	**24,046**	**159,875**	**39,560**	**6,100**	**41,654**	**116,284**	**42,463**	**105,914**
August 18, 1989§	**335,227**	**223,956**	**23,925**	**161,760**	**38,271**	**6,306**	**40,997**	**115,628**	**40,743**	**107,926**
August 26, 1988	**335,196**	**215,538**	**42,932**	**135,430**	**37,176**	**6,890**	**39,894**	**120,481**	**38,499**	**109,580**

*Includes 17,326 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API crude and product stocks

(Thousands of barrels)

		Motor gasoline				Jet fuels		Fuel oils		
	Crude oil	Total	Leaded†	Unleaded†	Blending Comp.†	Naphtha	Kerosine	Distillate	Residual	Unfinished oils
PAD I	13,587	61,604	2,950	53,759	4,895	1,259	10,273	49,225	19,219	12,157
PAD II	69,395	59,908	7,706	43,477	8,725	1,066	9,572	32,461	2,965	17,363
PAD III	159,793	64,077	4,645	44,086	15,346	2,083	15,864	27,615	14,197	49,320
PAD IV	11,785	6,248	1,667	2,823	1,758	348	767	2,747	615	2,297
PAD I-IV	**254,560**	**191,837**	**16,968**	**144,145**	**30,724**	**4,756**	**36,476**	**112,048**	**36,996**	**81,137**
PAD V	76,337*	28,156	5,431	15,247	7,478	1,809	5,600	9,968	7,277	22,843
September 22, 1989	**330,897***	**219,993**	**22,399**	**159,392**	**38,202**	**6,565**	**42,076**	**122,016**	**44,273**	**103,980**
September 15, 1989§	**328,959**	**218,615**	**21,623**	**157,098**	**39,894**	**6,347**	**41,814**	**121,369**	**43,538**	**104,137**
September 23, 1988	**318,827**	**218,545**	**41,537**	**139,220**	**37,788**	**6,729**	**40,860**	**132,189**	**43,568**	**107,382**

*Includes 20,609 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised.

Source: American Petroleum Institute

Data available in Oil & Gas Journal Energy Database.

API crude and product stocks

(Thousands of barrels)

		Motor gasoline				Jet fuels		Fuel oils		
	Crude oil	Total	Leaded†	Unleaded†	Blending Comp.†	Naphtha	Kerosine	Distillate	Residual	Unfinished oils
PAD I	14,698	62,281	1,967	55,222	5,092	981	12,093	50,552	23,296	14,520
PAD II	72,454	59,851	7,310	43,991	8,550	827	8,591	28,403	2,959	19,423
PAD III	161,976	65,465	3,563	45,759	16,143	2,089	16,023	26,339	14,330	49,609
PAD IV	11,966	6,323	1,792	2,965	1,566	353	659	2,571	523	2,440
PAD I-IV	**261,094**	**193,920**	**14,632**	**147,937**	**31,351**	**4,250**	**37,366**	**107,865**	**41,108**	**85,992**
PAD V	83,442*	29,244	6,074	15,678	7,492	1,611	6,026	10,793	7,682	25,545
October 27, 1989	**344,536***	**223,164**	**20,706**	**163,615**	**38,843**	**5,861**	**43,392**	**118,658**	**48,790**	**111,537**
October 20, 1989§	**336,454**	**223,156**	**21,275**	**163,063**	**38,818**	**6,060**	**43,656**	**119,966**	**47,508**	**108,998**
October 28, 1988	**333,262**	**214,570**	**38,075**	**139,316**	**37,179**	**6,409**	**41,469**	**128,786**	**40,105**	**109,068**

*Includes 24,009 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised.

Source: American Petroleum Institute

Data available in Oil & Gas Journal Energy Database.

API crude and product stocks

(Thousands of barrels)

		Motor gasoline				Jet fuels		Fuel oils		
	Crude oil	Total	Leaded†	Unleaded†	Blending Comp.†	Naphtha	Kerosine	Distillate	Residual	Unfinished oils
PAD I	14,688	65,801	1,391	59,913	4,497	1,147	11,545	52,739	24,817	13,879
PAD II	75,444	58,360	6,891	44,051	7,418	882	8,104	27,725	3,255	18,754
PAD III	160,755	61,506	2,780	42,715	16,011	2,277	17,108	26,817	13,118	53,161
PAD IV	11,943	6,757	1,848	3,030	1,879	394	775	2,614	464	2,461
PAD I-IV	**262,830**	**192,424**	**12,910**	**149,709**	**29,805**	**4,700**	**37,532**	**109,895**	**41,654**	**88,255**
PAD V	81,203*	29,698	5,207	16,117	8,374	1,340	6,245	9,670	9,423	24,384
November 24, 1989	**344,033***	**222,122**	**18,117**	**165,826**	**38,179**	**6,040**	**43,777**	**119,565**	**51,077**	**112,639**
November 17, 1989§	**348,943**	**223,456**	**18,433**	**165,670**	**39,353**	**5,866**	**44,118**	**119,264**	**51,894**	**113,089**
November 25, 1988	**340,067**	**216,648**	**38,607**	**141,117**	**36,924**	**6,621**	**39,300**	**127,477**	**40,925**	**111,134**

*Includes 20,774 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised.

Source: American Petroleum Institute

Data available in Oil & Gas Journal Energy Database.

API crude and product stocks

(Thousands of barrels)

		Motor gasoline				Jet fuels		Fuel oils		
	Crude oil	Total	Leaded†	Unleaded†	Blending Comp.†	Naphtha	Kerosine	Distillate	Residual	Unfinished oils
PAD I	13,453	64,272	1,228	58,195	4,849	1,234	11,026	45,375	22,858	12,883
PAD II	71,550	61,345	6,636	46,765	7,944	999	8,645	30,170	3,233	17,632
PAD III	162,797	63,708	2,788	45,382	15,538	2,177	16,265	26,802	13,492	53,215
PAD IV	11,987	7,547	1,957	3,494	2,096	343	804	3,007	464	2,371
PAD I-IV	**259,787**	**196,872**	**12,609**	**153,836**	**30,427**	**4,753**	**36,740**	**105,354**	**40,047**	**86,101**
PAD V	87,993*	30,348	5,780	16,938	7,630	1,428	7,396	11,437	9,123	22,101
December 15, 1989	**347,780***	**227,220**	**18,389**	**170,774**	**38,057**	**6,181**	**44,136**	**116,791**	**49,170**	**108,202**
December 8, 1989§	**343,663**	**223,598**	**17,916**	**167,326**	**38,356**	**6,043**	**43,992**	**118,466**	**50,423**	**109,158**
December 16, 1988	**340,338**	**224,857**	**39,069**	**147,343**	**38,445**	**6,290**	**37,804**	**125,989**	**44,824**	**106,292**

*Includes 24,863 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised.

Source: American Petroleum Institute

Data available in Oil & Gas Journal Energy Database.

API imports of crude and products

(Thousands of barrels daily)

	Districts 1-4		District 5		Total U.S.		
	1–27 1989	1–20* 1989	1–27 1989	1–20* 1989	1–27 1989	1–20* 1989	1–29 1988
Total motor gasoline	410	396	5	17	415	413	261
Leaded gasoline†	6	76	—	—	6	76	5
Unleaded gasoline†	404	320	5	17	409	337	256
Mo. gas. blending comp.	86	49	—	—	86	49	14
Distillate§	409	213	3	2	412	215	327
Residual	705	890	12	21	717	911	562
Jet fuel-naphtha	3	3	—	—	3	3	4
Jet fuel-kerosine	119	73	17	12	136	85	3
LPG	324	212	14	8	338	220	351
Unfinished oils	200	469	—	—	200	469	265
Other	187	413	—	7	187	420	602
Total products	**2,443**	**2,718**	**51**	**67**	**1,494**	**2,785**	**2,389**
Canadian crude	516	687	15	12	531	699	488
Other foreign	4,763	5,126	208	243	4,971	5,369	4,099
Total crude	**5,279**	**5,813**	**223**	**255**	**5,502**	**6,068**	**4,587**
Total imports	**7,722**	**8,531**	**274**	**322**	**7,996**	**8,853**	**6,976**

*Revised. †Included in total motor gasoline. §Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database

API imports of crude and products

(Thousands of barrels daily)

	Districts 1-4		District 5		Total U.S.		
	2–24 1989	2–17* 1989	2–24 1989	2–17* 1989	2–24 1989	2–17* 1989	2–26 1988
Total motor gasoline	397	127	20	3	417	130	315
Leaded gasoline†	6	—	—	—	6	—	10
Unleaded gasoline†	391	127	20	3	411	130	305
Mo. gas. blending comp.	93	161	—	—	93	161	71
Distillate§	487	447	3	3	490	450	137
Residual	592	785	37	30	629	815	711
Jet fuel-naphtha	3	3	—	—	3	3	2
Jet fuel-kerosine	178	136	13	19	191	155	22
LPG	174	223	10	15	184	238	250
Unfinished oils	245	219	—	1	245	220	162
Other	423	284	—	—	423	284	305
Total products	**2,592**	**2,385**	**83**	**71**	**2,675**	**2,456**	**1,975**
Canadian crude	606	601	15	15	621	616	674
Other foreign	3,909	3,840	133	79	4,042	3,919	3,986
Total crude	**4,515**	**4,441**	**148**	**94**	**4,663**	**4,535**	**4,660**
Total imports	**7,107**	**6,826**	**231**	**165**	**7,338**	**6,991**	**6,635**

*Revised. †Included in total motor gasoline. §Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database

API imports of crude and products

(Thousands of barrels daily)

	Districts 1-4		District 5		Total U.S.		
	3–31 1989	3–24* 1989	3–31 1989	3–24* 1989	3–31 1989	3–24* 1989	4–1 1988
Total motor gasoline	418	405	8	14	426	419	473
Leaded gasoline†	10	2	—	—	10	2	37
Unleaded gasoline†	408	403	8	14	416	417	436
Mo. gas. blending comp.	45	28	—	—	45	28	42
Distillate§	658	426	10	30	668	456	282
Residual	731	736	37	10	768	746	854
Jet fuel-naphtha	3	3	—	—	3	3	3
Jet fuel-kerosine	126	90	43	8	169	98	95
LPG	124	159	8	12	132	171	244
Unfinished oils	379	208	—	—	379	208	250
Other	44	204	—	4	44	208	409
Total products	**2,528**	**2,259**	**106**	**78**	**2,634**	**2,337**	**2,652**
Canadian crude	699	636	37	16	736	652	505
Other foreign	3,320	4,039	279	64	3,599	4,103	4,717
Total crude	**4,019**	**4,675**	**316**	**80**	**4,335**	**4,755**	**5,222**
Total imports	**6,547**	**6,934**	**422**	**158**	**6,969**	**7,092**	**7,874**

*Revised. †Included in total motor gasoline. §Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database

API imports of crude and products

(Thousands of barrels daily)

	Districts 1-4		District 5		Total U.S.		
	4-28 1989	4-21* 1989	4-28 1989	4-21* 1989	4-28 1989	4-21* 1989	4-29 1988
Total motor gasoline	499	272	100	29	599	301	459
Leaded gasoline†	12	30	—	—	12	30	22
Unleaded gasoline†	487	242	100	29	587	271	437
Mo. gas. blending comp.	87	15	—	—	87	15	71
Distillate§	221	351	3	4	224	355	345
Residual	931	520	43	19	974	539	417
Jet fuel-naphtha	7	2	—	—	7	2	3
Jet fuel-kerosine	128	131	4	17	132	148	24
LPG	135	188	9	8	144	196	280
Unfinished oils	377	178	—	—	377	178	264
Other	394	207	—	—	394	207	214
Total products	**2,779**	**1,864**	**159**	**77**	**2,938**	**1,941**	**2,077**
Canadian crude	809	523	28	31	837	554	758
Other foreign	4,390	4,837	407	344	4,797	5,181	3,477
Total crude	**5,199**	**5,360**	**435**	**375**	**5,634**	**5,735**	**4,235**
Total imports	**7,978**	**7,224**	**594**	**452**	**8,572**	**7,676**	**6,312**

*Revised. †Included in total motor gasoline. §Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database

API imports of crude and products

(Thousands of barrels daily)

	Districts 1-4		District 5		Total U.S.		
	5–26 1989	5–19* 1989	5–26 1989	5–19* 1989	5–26 1989	5–19* 1989	5–27 1988
Total motor gasoline	510	246	10	7	520	253	361
Leaded gasoline†	80	—	—	—	80	—	6
Unleaded gasoline†	430	246	10	7	440	253	355
Mo. gas. blending comp.	57	46	—	—	57	46	47
Distillate§	254	217	7	3	261	220	183
Residual	738	508	56	11	794	519	306
Jet fuel-naphtha	3	3	—	—	3	3	2
Jet fuel-kerosine	170	95	13	4	183	99	75
LPG	170	98	7	6	177	104	117
Unfinished oils	274	633	5	—	279	633	325
Other	299	165	—	33	299	198	152
Total products	**2,475**	**2,011**	**98**	**64**	**2,573**	**2,075**	**1,568**
Canadian crude	584	636	34	39	618	675	747
Other foreign	4,673	4,034	241	232	4,914	4,266	3,978
Total crude	**5,257**	**4,670**	**275**	**271**	**5,532**	**4,941**	**4,725**
Total imports	**7,732**	**6,681**	**373**	**335**	**8,105**	**7,016**	**6,293**

*Revised. †Included in total motor gasoline. §Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database

API imports of crude and products

(Thousands of barrels daily)

	Districts 1-4		District 5		Total U.S.		
	6–23 1989	6–16* 1989	6–23 1989	6–16* 1989	6–23 1989	6–16* 1989	6–24 1988
Total motor gasoline	325	623	4	9	329	632	456
Leaded gasoline†	4	7	—	4	4	11	16
Unleaded gasoline†	321	616	4	5	325	621	440
Mo. gas. blending comp.	16	16	—	—	16	16	82
Distillate§	137	231	2	1	139	232	357
Residual	244	575	19	31	263	606	356
Jet fuel-naphtha	3	3	—	—	3	3	3
Jet fuel-kerosine	92	57	38	4	130	61	123
LPG	196	96	6	8	202	104	85
Unfinished oils	472	446	6	5	478	451	376
Other	157	87	—	—	157	87	297
Total products	**1,642**	**2,134**	**75**	**58**	**1,717**	**2,192**	**2,136**
Canadian crude	671	592	—	33	671	625	708
Other foreign	5,264	4,934	285	348	5,549	5,282	3,584
Total crude	**5,935**	**5,526**	**285**	**381**	**6,220**	**5,907**	**4,292**
Total imports	**7,577**	**7,660**	**360**	**439**	**7,937**	**8,099**	**6,427**

*Revised. †Included in total motor gasoline. §Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database

API imports of crude and products

(Thousands of barrels daily)

	Districts 1-4 7–28 1989	Districts 1-4 7–21* 1989	District 5 7–28 1989	District 5 7–21* 1989	Total U.S. 7–28 1989	Total U.S. 7–21* 1989	Total U.S. 7–29 1988
Total motor gasoline	451	205	24	12	475	217	751
Leaded gasoline†	—	4	—	—	—	4	121
Unleaded gasoline†	451	201	24	12	475	213	630
Mo. gas. blending comp.	15	30	—	—	15	30	65
Distillate§	307	393	4	5	311	398	355
Residual	466	347	18	9	484	356	531
Jet fuel-naphtha	3	3	—	—	3	3	3
Jet fuel-kerosine	204	206	36	22	240	228	73
LPG	214	193	7	6	221	199	215
Unfinished oils	276	572	—	5	276	577	502
Other	48	229	—	—	48	229	326
Total products	**1,984**	**2,178**	**89**	**59**	**2,073**	**2,237**	**2,821**
Canadian crude	611	545	11	8	622	553	605
Other foreign	5,700	5,573	266	242	5,966	5,815	4,472
Total crude	**6,311**	**6,118**	**277**	**250**	**6,588**	**6,368**	**5,077**
Total imports	**8,295**	**8,296**	**366**	**309**	**8,661**	**8,605**	**7,898**

*Revised. †Included in total motor gasoline. §Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API imports of crude and products

(Thousands of barrels daily)

	Districts 1-4 8–25 1989	Districts 1-4 8–18* 1989	District 5 8–25 1989	District 5 8–18* 1989	Total U.S. 8–25 1989	Total U.S. 8–18* 1989	Total U.S. 8–26 1988
Total motor gasoline	497	236	18	44	515	280	597
Leaded gasoline†	—	—	—	—	—	—	25
Unleaded gasoline†	497	236	18	44	515	280	572
Mo. gas. blending comp.	87	120	—	—	87	120	48
Distillate§	217	324	3	6	220	330	156
Residual	344	352	8	8	352	360	387
Jet fuel-naphtha	4	3	—	—	4	3	4
Jet fuel-kerosine	102	81	17	17	119	98	78
LPG	267	119	42	4	309	123	97
Unfinished oils	448	442	5	—	453	442	212
Other	128	60	—	—	128	60	168
Total products	**2,094**	**1,737**	**93**	**79**	**2,187**	**1,816**	**1,747**
Canadian crude	684	584	—	7	684	591	622
Other foreign	5,365	6,040	235	308	5,600	6,348	4,714
Total crude	**6,049**	**6,624**	**235**	**315**	**6,284**	**6,939**	**5,336**
Total imports	**8,143**	**8,361**	**328**	**394**	**8,471**	**8,755**	**7,083**

*Revised. †Included in total motor gasoline. §Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in: Oil & Gas Journal Energy Database.

API imports of crude and products

(Thousands of barrels daily)

	Districts 1-4 9–29 1989	Districts 1-4 9–22* 1989	District 5 9–29 1989	District 5 9–22* 1989	Total U.S. 9–29 1989	Total U.S. 9–22* 1989	Total U.S. 9–30 1988
Total motor gasoline	282	300	19	13	301	313	343
Leaded gasoline†	—	—	—	—	—	—	17
Unleaded gasoline†	282	300	19	13	301	313	326
Mo. gas. blending comp.	200	12	—	—	200	12	51
Distillate§	93	273	2	5	95	278	244
Residual	407	456	19	11	426	467	451
Jet fuel-naphtha	12	—	—	—	12	—	3
Jet fuel-kerosine	45	107	4	17	49	124	56
LPG	198	130	5	5	203	135	209
Unfinished oils	472	450	2	3	474	453	335
Other	55	53	—	—	55	53	269
Total products	**1,764**	**1,781**	**51**	**54**	**1,815**	**1,835**	**1,961**
Canadian crude	587	650	36	43	623	693	617
Other foreign	5,572	4,667	196	251	5,768	4,918	5,046
Total crude	**6,159**	**5,317**	**232**	**294**	**6,391**	**5,611**	**5,663**
Total imports	**7,923**	**7,098**	**283**	**348**	**8,206**	**7,446**	**7,624**

*Revised. †Included in total motor gasoline. §Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API imports of crude and products

(Thousands of barrels daily)

	Districts 1-4 10–27 1989	Districts 1-4 10–20* 1989	District 5 10–27 1989	District 5 10–20* 1989	Total U.S. 10–27 1989	Total U.S. 10–20* 1989	Total U.S. 10–28 1988
Total motor gasoline	300	503	19	29	319	532	441
Leaded gasoline†	—	—	—	—	—	—	—
Unleaded gasoline†	300	503	19	29	319	532	441
Mo. gas. blending comp.	179	49	9	—	188	49	121
Distillate§	203	221	1	2	204	223	365
Residual	756	464	22	4	778	468	600
Jet fuel-naphtha	4	46	—	—	4	46	3
Jet fuel-kerosine	46	43	2	2	48	45	98
LPG	166	175	8	7	174	182	289
Unfinished oils	253	290	29	—	282	290	238
Other	78	148	—	—	78	148	336
Total products	**1,985**	**1,939**	**90**	**44**	**2,075**	**1,983**	**2,491**
Canadian crude	572	560	15	16	587	576	698
Other foreign	5,938	4,301	293	275	6,231	4,576	4,292
Total crude	**6,510**	**4,861**	**308**	**291**	**6,818**	**5,152**	**4,990**
Total imports	**8,495**	**6,800**	**398**	**335**	**8,893**	**7,135**	**7,481**

*Revised. †Included in total motor gasoline. §Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API imports of crude and products

(Thousands of barrels daily)

	Districts 1-4 11–24 1989	Districts 1-4 11–17* 1989	District 5 11–24 1989	District 5 11–17* 1989	Total U.S. 11–24 1989	Total U.S. 11–17* 1989	Total U.S. 11–25 1988
Total motor gasoline	147	416	5	15	152	431	566
Leaded gasoline†	—	—	—	—	—	—	—
Unleaded gasoline†	147	416	5	15	152	431	566
Mo. gas. blending comp.	—	179	—	12	—	191	58
Distillate§	180	293	2	3	182	296	282
Residual	463	882	—	45	463	927	625
Jet fuel-naphtha	—	—	—	—	—	—	3
Jet fuel-kerosine	15	26	5	—	20	26	69
LPG	103	129	9	6	112	135	269
Unfinished oils	105	395	1	39	106	434	322
Other	386	158	2	2	388	160	57
Total products	**1,399**	**2,478**	**24**	**122**	**1,423**	**2,600**	**2,251**
Canadian crude	595	488	17	6	612	494	644
Other foreign	4,846	5,103	273	371	5,119	5,474	4,109
Total crude	**5,441**	**5,591**	**290**	**377**	**5,731**	**5,968**	**4,753**
Total imports	**6,840**	**8,069**	**314**	**499**	**7,154**	**8,568**	**7,004**

*Revised. †Included in total motor gasoline. §Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API imports of crude and products

(Thousands of barrels daily)

	Districts 1-4 12–15 1989	Districts 1-4 12–8* 1989	District 5 12–15 1989	District 5 12–8* 1989	Total U.S. 12–15 1989	Total U.S. 12–8* 1989	Total U.S. 12–16 1988
Total motor gasoline	313	373	14	14	327	387	279
Leaded gasoline†	21	—	—	—	21	—	7
Unleaded gasoline†	292	373	14	14	306	387	272
Mo. gas. blending comp.	123	97	—	7	123	104	30
Distillate§	355	161	5	3	360	164	305
Residual	638	472	10	8	648	480	735
Jet fuel-naphtha	3	3	—	—	3	3	3
Jet fuel-kerosine	192	50	10	2	202	52	58
LPG	199	302	8	2	207	304	238
Unfinished oils	143	298	2	1	145	299	381
Other	192	156	—	2	192	158	289
Total products	**2,158**	**1,912**	**49**	**38**	**2,207**	**1,951**	**2,318**
Canadian crude	669	679	15	9	684	688	728
Other foreign	5,232	4,820	336	191	5,568	5,011	3,983
Total crude	**5,901**	**5,499**	**351**	**200**	**6,252**	**5,699**	**4,711**
Total imports	**8,059**	**7,411**	**400**	**238**	**8,459**	**7,650**	**7,029**

*Revised. †Included in total motor gasoline. §Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

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